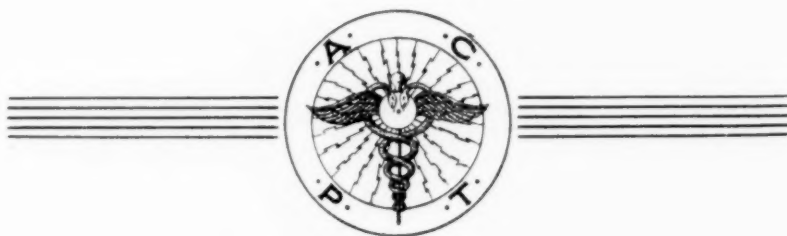

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ORIGINAL ARTICLES

- Ultraviolet Radiation and Ozone as Aerial Disinfectants
.....W. W. Coblenz, Ph.D. 709
- Suggested Uses of Refrigeration Anesthesia; Including
War Surgery.....Frederick M.
Allen, M.D., and Lyman Weeks Crossman, M.D. 711
Discussed by Drs. J. W. Shirer, M. K. Newman, and
Lyman Weeks Crossman.
- Making Man Power.....George G.
Deaver, M.D., and Mary Eleanor Brown, M.A. 719
- Present Status of Electrical Stimulation of Denervated
Muscle.....F. S. Grodins,
M.D.; S. L. Osborne, Ph.D., and A. C. Ivy, M.D. 729

Editorials 735

Medical News 738

Book Reviews 742

Physical Therapy Abstracts 749

INDEX

Volume XXIII, January-December, 1942, Inclusive..... 753

EDITOR OF THE MONTH

FRED B. MOOR, M.D.

Los Angeles

Schools Approved for Training Physical Therapy Technicians by the Council on Medical Education and Hospitals

Name and Location of School	Medical Director	Entrance Requirements *	Duration and Time of Admissions Regular Course	Emergency Course	Tuition †
Children's Hospital, Los Angeles	Steele F. Stewart, M.D.	(a) R. N. (b) Phys. educ. major (c) 2 yrs. coll.	12 mos. Feb. and Sept.	6 mos. Feb. and Sept.	\$200 R \$200 E
College of Medical Evan- gelists, Los Angeles	Fred B. Moor, M.D.	(a) R. N. (b) Phys. educ. major (c) 2 yrs. coll.	12 mos.		
Stanford University California	William H. Northway, M.D.	(a) R. N. (b) Phys. educ. major (c) 3 yrs. coll.	12 mos. Jan. and June	7 mos. Jan. and June	\$429 R \$286 E
Walter Reed General Hospital, Wash., D.C.	B. A. Strickland, Jr., Capt., M. C.	Phys. educ. major		6 mos. Quarterly	None
Northwestern Univ. Medical School, Chgo.	John S. Coulter, M.D.	(a) R. N. (b) Phys. educ. major (c) 3 yrs. coll.	9 mos. Oct.	6 mos. Jan. and July	\$200 R \$200 E
Bouvé-Boston School of Physical Education, Boston	Arthur L. Watkins, M.D.	High school grad.	3 yrs. 4 yrs. ‡ Sept.	6 mos.	\$400 R ? E
Harvard Medical School, Boston	Frank R. Ober, M.D.	(a) R. N. (b) Phys. educ. major (c) 2 yrs. coll. §	9 mos. Sept. and March	6 mos. Sept. and March	\$200 R \$200 E
Boston Univ. Sargent College of Physical Education, Cam- bridge, Mass.	Louis Howard, M.D.	2 yrs. coll.	2 yrs. Oct.		\$547
University of Minn., Minneapolis	M. E. Knapp, M.D.	(a) R. N. (b) Phys. educ. major (c) Med. tech. grad. with B.S. degree	12 mos. June and Sept.		Univ. fees
Mayo Clinic, Rochester, Minn.	Frank H. Krusen, M.D.	(a) R. N. (b) Phys. educ. major (c) 2 yrs. coll.		6 mos. Jan. and July	None
Barnes Hospital, St. Louis	Frank H. Ewerhardt, M.D.	(a) R. N. (b) Phys. educ. major (c) 2 yrs. coll.	9 mos.		
St. Louis University, School of Nursing, St. Louis	Alexander J. Kotkis, M.D.	High school grad.	4 yrs. Jan. and Sept.		\$250 yr.
University of Buffalo, School of Nursing, Buffalo	George G. Martin, M.D.	(a) R. N. (b) Phys. educ. major (c) 2 yrs. coll.	12 mos. Feb. and Sept.	6 mos. Feb. and Sept.	\$425 R \$375 E
Hospital for Special Surgery, New York City	Kristian G. Hansson, M.D.	(a) R. N. (b) Phys. educ. major (c) 2 yrs. coll.	9 mos. Sept.	6 mos. Sept.	\$300 R \$200 E
New York University, New York City	William Bierman, M.D.	(a) R. N. (b) Phys. educ. major (c) 2 yrs. coll.	9 mos.		
D. T. Watson School of Physiotherapy, Leetsdale, Pa.	Jessie Wright, M.D.	(a) R. N. (b) Phys. educ. major (c) 2 yrs. coll. ¶	2 yrs. Sept.	6 mos. Jan. and July	None R \$200 E
Richmond Professional Institute of the Col- lege of William and Mary, Richmond, Va.	Thomas W. Wheeldon, M.D.	(a) R. N. (b) Phys. educ. major (c) Coll. graduate (d) High school grad.	8 mos. 4 yrs. Feb. and Sept.		Coll. fees
University of Wiscon- sin Medical School, Madison	Ernst A. Pohle, M.D.	(a) R. N. (b) Phys. educ. major	12 mos. Feb. and Sept.	6 mos.	Univ. fees R
University of California Hospital, San Francisco	Frances Baker, M.D.	(a) R. N. (b) Phys. educ. major (c) B. A. degree **	48 wks. October		\$150.00
Cleveland Clinic Foun- dation Hospital, Cleveland, Ohio	Walter J. Zeiter, M.D.	(a) R. N. (b) Phys. educ. major (c) 2 yrs. coll.	9 mos. July		None

* Courses are so arranged that any of the entrance requirements (a, b, c or d) will qualify students for training.

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Tuberculosis: Irradiation is of distinct value for patients suffering from tuberculosis of the bones, articulations, peritoneum, intestine, larynx and lymph nodes or from tuberculous sinuses.

Other Applications: As an adjuvant in the treatment of secondary anemia, irradiation merits consideration. Also exposure of the lesions of erysipelas and a wide area of surrounding tissue has been shown to have a favorable effect.

ULTRAVIOLET RADIATION AND OZONE AS AERIAL DISINFECTANTS

W. W. COBLENTZ, Ph.D., Sc.D.

Radiation Physicist, National Bureau Standards

Member, Council on Physical Therapy, American Medical Association

WASHINGTON, D. C.

In view of the wide publicity that is being given to the use of ultraviolet radiation and ozone for disinfecting purposes, particularly in lay publications, this seems an appropriate time and place to summarize the results of recent investigations of their merits and limitations.

It is well established that in the present day commercial low vapor-pressure mercury discharge lamps (whether in a quartz or in a transparent glass burner), over 90 per cent of the germicidal radiation is in the powerful resonance emission line at wavelength 2,537 angstroms. Ultraviolet radiation of wavelengths shorter than about 2,200 angstroms emitted by this type of lamp, although of much lower intensity, unavoidably produces an appreciable amount of ozone. Hence, the problem of the manufacturer of an ultraviolet lamp for use in disinfecting the air in a room occupied by human beings is to produce a burner that transmits the maximum amount of germicidal radiation of wavelength 2,537 angstroms and a minimum amount of radiation of shorter wavelengths that produces ozone.

Since the cut-off in transparency to wavelengths shorter than about 2,300 angstroms is not sharp, the thickness of the glass wall of the burner is a compromise, determined by the maximum concentration of ozone tolerable without injury to the occupants of the room undergoing disinfection. In that sense the advertising slogan that the lamp produces a "controlled amount of ozone" is correct. However, it is to be emphasized that this production of ozone is not intentional, for beneficial purposes (e. g., to dispel odors and as a germicide), but is unavoidable.

Since ozone is more toxic than carbon monoxide,¹ as will be noted presently, for the use of ultraviolet radiation as a disinfectant of occupied rooms the safest procedure would be to prevent the generation of ozone. In fact, seven years before this question became acute, Rosenau² expressed the view that, since human beings are injuriously affected by much smaller amounts of this gas than are necessary to produce an appreciable bactericidal effect, "ozone has no place in practical disinfection of occupied places."

I. Ultraviolet Lamps for Disinfecting Purposes

In order to kill a micro-organism a direct hit by ultraviolet rays of certain wavelengths and of sufficient intensity is required. To produce adequate disinfection a germicide must effect practically 100 per cent killing. Ultraviolet germicidal rays cannot penetrate deeply and hence are readily absorbed by finger marks, saliva, cosmetics or other contamination on drinking cups, dishes, food containers, etc.

After extensive consultation with bacteriologists, physiologists, physicists, chemists, ventilating engineers and other qualified scientists, and after an extensive review of present day researches on this subject, the Council on Physical Therapy of the American Medical Association adopted a set of regulations for acceptance of ultraviolet lamps for use as an adjuvant in the disinfection of air.³

In this acceptance the various applications of ultraviolet radiation as a disinfectant were analyzed, and it was concluded that the ultraviolet germicidal lamp is an uncertain means of sterilizing unfiltered liquids (transparent to ultraviolet radiation) and solid objects (drinking cups, combs, brushes, shaving utensils, shoes, toilet seats, etc.), even if irradiation of the whole surface is possible.

The use of ultraviolet radiation for disinfecting air in industrial plants, barracks, schoolrooms, assembly halls, refrigerators for tenderizing meat, and so on, appeared outside the Council's purview. In fact, the whole question of the use of ultraviolet radiation for disinfecting purposes is so complex and so little understood that the Council voted to consider only ultraviolet lamps that are acceptable for use in this method of disinfecting air in hospitals, nurseries and operating rooms (relatively free from dust) as practiced by present day empiric methods.

As to the correctness of the Council's viewpoint in limiting the scope of its responsibility, it is of interest to note that Wells⁴ and his collaborators have since found that, in contrast with childhood contagions, the total number of colds after installation of ultraviolet disinfecting lamps in the Germantown Friends School showed no detectable reduction. Evidently the wide publicity in the lay press regarding the prevention of colds by means of ultraviolet disinfecting lamps was premature.

II. Ozone in Ventilation and in Aerial Disinfection

Recently Witheridge and Yaglou⁵ investigated the possibilities and limitations of ozone for counteracting body odors in ordinary occupied rooms. They found that it required a concentration of 0.015 p. p. m. (part per million, by volume) to reduce body odor sufficiently to permit a reduction of 50 per cent of the fresh air requirement for odor control. Lower concentrations were ineffective on body odor; higher concentrations (0.04 p. p. m.) were irritating to the mucous membranes of the upper respiratory tract.

An important observation was that ozone did not destroy the odors but simply "masked" them. That is to say, the odoriferous material appeared to be absorbed on the wall surfaces, and when the generation of ozone ceased, desorption began, and the odors reappeared. In the discussion that followed the presentation of their paper, Yaglou replied that, granting that their ozone generator could have produced 1 part of nitrogen dioxide in 150 parts of ozone, the result would have been 0.0003 p. p. m. of nitrogen dioxide. The maximum allowable concentration for prolonged exposure is 39 p. p. m. of nitrogen dioxide as compared with 0.04 p. p. m. of ozone.

The conclusion arrived at by Witheridge and Yaglou is that, because of its great toxicity, the use of ozone for disinfecting and deodorizing occupied spaces should be discouraged. Indeed, in a recent paper on disinfection of air by air-conditioning processes, Yaglou and Wilson⁶ stated that, since the killing power of ozone for air-borne organisms is small when the concentration does not exceed the limit of human tolerance (4 p. p. m. of ozone), "it is now generally recognized that as a bactericide ozone has no place in air conditioning."

A recent investigation of the merits of ozone as an aerial disinfectant was made by Elford and Ende⁸ in connection with the disinfection of air raid shelters. Their interest was in determining whether ozone when present in the atmosphere in concentrations that can be tolerated by man exerts a bactericidal action on micro-organisms suspended in the air. According to the humidity of the air, they found that in concentrations not exceeding 0.04 p. p. m. (the limit of tolerance found by Witheridge and Yag-

lou) ozone does exert a disinfecting action, but only on certain kinds of bacteria dispersed in the atmosphere. Their work substantiated the conclusions of Yaglou and Wilson⁶ that as a bactericide ozone is an uncertain and dangerous adjunct in air conditioning.

From the foregoing summary it seems evident that the wide publicity in lay publications relative to the use of ultraviolet radiation and ozone as disinfectants is not justified and that if not used intelligently these two germicides may cause serious injury to the occupants of places undergoing disinfection.

2737 Macomb St., N. W.

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SUGGESTED USES OF REFRIGERATION ANESTHESIA INCLUDING WAR SURGERY *

FREDERICK M. ALLEN, M.D.

and

LYMAN WEEKS CROSSMAN, M.D., F.A.C.S.

NEW YORK, N. Y.

Our principal use of refrigeration has been for amputations of limbs. The material of this paper has been selected accordingly and will include clinical observations and results. The introductory discussion may be divided into three sections: (1) theory of the use of cold for operations, (2) postoperative treatment and (3) measures preparatory to operation or for nonoperative treatment.

General Discussion

1. *Refrigeration for Operations.* — It is important to emphasize that the tissues are not frozen; use of the word freezing conveys false impressions. The tissues are not made stiff as they are with an ethyl chloride spray. There is no danger of necrosis or frostbite. The work was begun with the thought of tissues kept alive for long periods in an icebox, and the temperatures used are of that order. Any level down to the freezing point is harmless, but as

* Read at the Twenty-first Annual Session of the American Congress of Physical Therapy, Pittsburgh, Pa., September 11, 1942.

a safeguard against accidental freezing a temperature of about 5 C. is conservative and effective.

The first means used for chilling was immersing the limb in ice water. For a bed patient the extremity can be buried in cracked or (preferably) pulverized ice. Do not use salt with the ice. There are also ways of using ice bags. The choice is a matter of convenience, but lately the City Hospital has had the advantage of refrigerating equipment designed for this special purpose. This apparatus not only saves the work and mess which are the chief disadvantages of the ice technic but assures maintenance of a constant temperature for any desired length of time.

The principle of refrigeration for surgical anesthesia is simple; namely, cold nerves cannot transmit impulses, and cold tissues cannot respond with shock or any other harmful reaction. Opposed to these facts is a prevalent fear that the low temperature may in itself cause injury. According to both the animal experiments and the clinical observations, such injury is non-existent. It becomes necessary to explain why the wounds heal somewhat better after refrigeration than after other methods of operation.

Sufficient chilling of the skin with ice or other means may produce enough anesthesia for the most superficial operations, such as skin grafting. For deeper operations a tourniquet is indispensable. Through its use the state of excised tissues in an icebox is imitated by effective isolation of the limb even though the organic connection is retained. The stoppage of circulation must be complete, in order that the flowing blood shall not carry warmth into the limb, which must be chilled, or carry cold to the rest of the body, which must remain warm.

Granting that the skin temperature is maintained somewhere near 5 C., the time required to produce surgical anesthesia is at present a question of empiric judgment according to the thickness of the limb. The shortest time ordinarily used for a foot or a calf is one hour, and the longest time for a thigh is two and one-half or three hours. Dr. F. K. Safford, of the physical therapy department of the City Hospital, is engaged in adding precise thermocouple measurements showing that the deep muscles soon reach a temperature fully as low as that of the skin.

We have previously noticed that when the refrigeration is too brief for complete anesthesia, there are both attenuation and delay of pain sensation. If the chilling is continued beyond the ordinary maximum duration, no harm results. This elasticity of time is convenient, allowing leeway for accidental delays of operations. The importance of this considerable safe interval for military purposes will be mentioned later.

The net result of the method is an operation without pain, shock or loss of blood, so that both before and after a major amputation a patient eats his regular meals and carries out his regular routine in other respects. This absence of constitutional disturbance and preservation of constitutional strength doubtless contribute appreciably to the favorable results in senile or debilitated patients.

2. *Postoperative Treatment.* — We have previously mentioned our use of ice bags or apparatus for moderate chilling of the stump after amputation. The theoretic purpose is to keep the local metabolism reduced, because the limited circulation in arteriosclerosis may be scarcely sufficient for the ordinary nutrition of the tissues and is particularly insufficient for the extra demands of postoperative inflammation. This conception can explain the familiar tendency to gangrene after operation in tissues that were free from gangrene before operation. The reduction of local metabolism by reduced temperature is apparently not accompanied by a corresponding reduction of

blood supply, because in practice the cold is found to prevent sloughing or reduce it to a minimum. Chances can be taken with low levels of amputation if desired, because failure does not result in such rapid or extensive necrosis as to make reamputation difficult or dangerous.

Edema may be assumed to be harmful in two ways, namely, by pressure which injuriously reduces capillary circulation and by providing of a medium for the growth and spread of infectious organisms. Proper chilling usually prevents edema. Adding to this the direct action of cold in inhibiting bacteria, we have thus far three reasons why rapid or dangerous sloughing of wound flaps does not occur.

In consequence of these various factors, high thigh amputations are practically obsolete in the City Hospital, and the lower levels of amputation are presumably one reason for reduced constitutional strain and mortality. The supracondylar amputation, which involves a minimum of muscle cutting or general trauma, represents the high level of amputations in our service. This holds true for arteriosclerosis with the poorest tissue nutrition and for infections with lymphangitis visible well up in the thigh or with the knife cutting directly through areas of pus. The inhibition of bacteria and the seemingly favorable influence on tissue vitality have given successful results without the need of resorting to higher amputation levels.

When drainage is needed, the reduced temperature can prevent agglutination of the wound margins and keep up an active flow of bright odorless exudate. The noticeable pink color of the cold tissues, together with the bright pink discharge, seems to indicate a superoxygenation of the tissues and fluids. It can be assumed theoretically that the cold tissues take up much less oxygen than usual from the arterial blood, with the result of an unusually high oxygenation of the capillary and venous blood and tissue fluids. We hope to have this assumption tested by chemical analysis. Possibly this factor may conduce to maintainance of tissue vitality. We suspect also that with this method there is a higher oxygen content of the local fluids than can be produced by any other known means; and if so, the combination of high oxygenation and low temperature seems particularly promising for combating gas-forming and all anaerobic infections.

The chilling of the stump obviates pain not only during the operation but during convalescence, so that sedatives are seldom needed. The good preservation of blood vessel walls and the inhibition of blood coagulation by cold may explain the absence of thrombosis or embolism in our series to date. There is an absence of gastrointestinal and all systemic complications.

These results have been obtained by merely empiric methods. Arbitrarily, ice bags or apparatus are used postoperatively to produce a diminishing refrigeration, which tapers off to an end in three days. Changes are apt to be made according to appearances in individual cases. We have no certain knowledge concerning the optimum temperature, optimum time or any other details. The aim is to be conservative, in using as little cold as seems required, partly because the time for wound healing is lengthened by low temperatures. Objective data for standardizing or guiding the treatment are one of the goals of further research.

3. *Preparatory or Nonoperative Treatment.* — Measures for preparatory and for nonoperative treatment belong together because the only difference may be in the point of view, whether the necessity of operation is known and accepted or whether there is more or less hope of cure without operation.

There is a possible division into treatment with or without a tourniquet. The tourniquet is obviously important in traumatic cases with hemorrhage. The tourniquet as ordinarily used causes more or less impairment of tissue

vitality and shock, even though it is released at short intervals according to military regulations. We hope to learn the safe limits for chilled limbs. The guesses and prejudices which now prevail are worthless. It seems conservative to declare that with a proper tourniquet and proper refrigeration, the human leg can be kept bloodless for eight hours without injury. In one case an upper extremity was ligated and refrigerated for forty-eight hours before amputation without bad effects.

There is no reason why the arm should be more susceptible than the leg to necrosis, but it is more susceptible to paralysis. Its susceptibility is much less at a low temperature than at ordinary temperatures; there also is reason to hope that the paralysis may be temporary. How conservative this eight hour suggestion is may be judged by the fact that normal limbs can tolerate more than twelve hours of complete asphyxis at ordinary temperatures without gangrene, and when chilled near to freezing the animal legs in experiments could survive more than fifty-four hours and the rats' tails of Brooks and Duncan could survive more than ninety-six hours. The only real problem is that of pressure and the contact of warm and cold tissues in the zone of the tourniquet. It is certain that refrigeration can greatly extend the usefulness of the tourniquet in military surgery, and when the purely mechanical difficulties are overcome a greatly lengthened time will be provided for the transportation or preparation of limb casualties without hemorrhage, pain, shock, infection or tissue damage.

The same method can be applied when necessary to civil cases involving either wounds or gangrene. A dangerously infected limb can be separated from the body as effectively by a tourniquet and refrigeration as by amputation, and it is feasible for the operation to be deferred for several days if necessary.

The penetration of cold without a tourniquet is governed chiefly by the blood supply. Extreme arteriosclerosis, with its greatly reduced blood flow, makes possible a more efficient through and through chilling of the limb and less chilling of the rest of the body than with normal circulation. McElvenny has packed arteriosclerotic legs in ice for various periods up to one month continuously, until the patient gained sufficient strength for an ultimate successful amputation. We have likewise chilled infected limbs without a tourniquet for a number of days, with the result that advancing gangrene, infection and systemic intoxication have been checked.

After embolism, Crossman, Hurley, Warden and others have chilled limbs with ice or apparatus for periods up to two weeks, with or without embolectomy. The theoretic conception of ideal treatment is that, when possible, a tourniquet should be placed above the point of embolism at the earliest possible moment after it has occurred, and refrigeration applied. In this way pain is abolished, thrombosis and injury to vessel walls are minimized and the limb is ready for embolectomy. These ideal conditions were not obtainable with any of the patients treated by our group.

Unmistakably, the gangrene of both arteriosclerosis and embolism can be delayed by reduced temperature. Theoretically, when an embolism is low enough there should be a chance for saving the limb without embolectomy by the gradual development of a collateral circulation. Actually, we have not seen a permanent saving of any limb with arteriosclerosis or with a high embolism in a case received too late for successful operation, though the benefits have been sufficient to warrant our adoption of refrigeration as a routine in such cases.

Likewise we have never seen an infection finally cured by refrigeration without operation, but it should be added that we have dealt only with in-

fections which were inherently hopeless. The relative effects of the low temperature on the tissues and on the invading organisms over a long period are an interesting problem for study. We know that various bacteria pathogenic to man cannot attack cold-blooded animals because the temperature is too low. In our hopelessly infected or gangrenous limbs, cold has seemed to arrest the process for a few days, after which it advanced slowly, as though the bacteria had adjusted themselves or new strains had entered which could withstand the cold. The experience of Fay and others who have used cold over prolonged periods will be more instructive than our limited observations.

A brief summary in another important field, is that members of the general medical profession for a long time have obtained moderate relief of pain by the moderate use of cold. The remarks of a few old time surgeons on the drastic use of cold passed unheeded. The relief of severe pain by radical use of cold and the development of apparatus for this purpose may be credited as one of the important contributions of Dr. Temple Fay. The adoption of this method seems to be limited by the rather formidable measures which have been employed to control the severest pain. We have no experience with general hypothermia or with prolonged local refrigeration for pain, but there is a collaboration of Dr. Crossman's surgical service and Dr. Safford's physical therapy department in unpublished work on a simplified use of cold, in shorter or longer treatments. A tourniquet may be used, but it is not certain that the results are any better than without it. Dispensing with a tourniquet makes possible refrigeration of such regions as the shoulders, hips and spine and even of the head for headache or migraine. Pain which has an organic cause is not cured, and the temporary relief may be unimportant or perhaps be followed by exacerbation. There may also be failure in cases of pain of functional or unknown origin. In certain other cases there is a gratifying temporary relief, and in still others a few treatments produce something like a lasting cure. This benefit is important when, as sometimes happens, it is obtained in cases in which the pain has been distressing for a long time. We are trying to learn more of the method of treatment and the ailments for which it may or may not be suitable. A more detailed publication will be made, and in this preliminary announcement no conclusion will be ventured except that local refrigeration treatments have enough value to warrant investigation by departments of physical therapy.

Whether the tourniquet is used for operation or for treatment, at least two details should be made clear, because there is greater liability to mistakes with it than with any other part of the procedure. First, it is essential that the tourniquet be applied tightly enough to stop all blood flow, and, while excessive tightness is theoretically undesirable, we have had no trouble on this account, and it appears better to err on the side of too much than too little tension.

Second, we generally apply ice bags (thin, bare rubber, not cloth covered) around the proposed site for twenty to thirty minutes prior to application of the tourniquet, after which there is usually little complaint of pain from the application. Folds of the skin should be avoided, and the clamp holding the ends of the rubber tube should be prevented from touching the skin. Immediately after this, the limb is buried in fine ice in a rubber sheet or immersed in ice water to a level an inch or two above the tourniquet. We have previously mentioned our use of an electric refrigerating apparatus, which is preferable to ice, and we have the promise of an improved model, which will anesthetize an extremity in about one-third the time required by the former methods.

War Surgery

Suggestions may be made for the management of severe wounds, burns and operations on limbs according to three plans, namely, use of the tourniquet without refrigeration, use of refrigeration without the tourniquet or use of the tourniquet plus refrigeration.

1. If a limb is so badly injured that it must obviously be amputated and immediate operation is not feasible, a tight tourniquet may be applied just distal to the expected site of amputation. This tourniquet is not to be loosened at intervals, as commonly advised; on the contrary the vitally essential point is that it must never be loosened. Hemorrhage, pain and progressive shock are thus radically controlled. We believe we are the only ones to have furnished proof with animal experiments that such a tourniquet can be left in position indefinitely and that even if the tissues below the tourniquet become putrid in the course of several days the constitutional danger is lessened. As soon as operation is practicable, it is to be performed proximal to the tourniquet without ever removing the tourniquet.

2. Evidence is accumulating, from animal experiments and clinical observations that refrigeration with ice, ice water, ice bags or apparatus is a valuable adjunct to the treatment of various injuries. We hope to see open fractures thus treated, as well as other severe wounds. Burned areas may be treated with the most thorough chilling possible without a tourniquet, chilling being continued if necessary for a number of days. Any other indicated treatment may be employed simultaneously, but the advantages of cold consist in the reduction of pain, shock, edema (or bleb formation or serous oozing), bacterial growth and toxic absorption.

3. Refrigeration obviously extends greatly the time for which a tourniquet can be safely applied, probably at least six or eight hours without tissue damage. In winter weather, cold may thus be used easily and the chief necessity may be precautions against freezing. When natural or artificial ice is not available, a special form of the refrigeration apparatus can be furnished for military purposes. It measures 14 by 14 by 28 inches and weighs 200 pounds. It can be placed on the floor, sides or top of a truck or ambulance, or on the running board or under the driver's seat, and it is operated by the engine of the automobile. In this way limb casualties can be transported without detriment and can be ready for shockless operation at any time. We believe no other technic is equally free from injuries or complications. The method has already made favorable impressions on some officers of the armed forces when tried in Army and Navy hospitals.

Résumé

Refrigeration has proved valuable as an anesthetic which enables the surgeon to operate in a bloodless and shockless field. Postoperatively, the low temperature reduces local metabolism so that a limited blood supply may be adequate for the need and thereby diminishes the tendency to sloughing. It also aids by inhibiting pain, edema and bacterial activity and sometimes by favoring drainage. Preparatory and nonoperative measures are described, including applications to military surgery and treatment of war wounds.

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Discussion

Dr. J. W. Shirer (Pittsburgh, Pa.): The application of the principle of refrigeration to surgical problems is not new but was advocated by a French surgeon, Baron D. J. Larrey, in the Napoleonic wars. In his memoirs Larrey wrote of his experiences in the campaign in Russia, Germany and France. He recorded the use of crushed ice in surgical treatment of aneurysms and the decrease in morbidity and mortality from amputations, which he noted were accomplished without pain during the extreme cold of the winter campaigns of Smolensk, etc. For the reapplication of this principle to modern surgery and for furthering the investigative work, Dr. Allen and Dr. Crossman should be highly commended.

We have had no large experience with this procedure, but I believe sufficient to warrant several observations. We have checked with blood pressure readings during the various steps of amputation, with electrocardiographic records and with notation of the general cardiac responses and concur fully in the statements of Dr. Allen and Dr. Crossman as to the absence of shock during and after operation. The patients we have had to deal with were critically ill and we felt could not withstand the shock associated with the usual surgical methods and anesthesia. In fact, in one patient we amputated at the mid-thigh, merely as a last resort, and were successful, when he was comatose and had Cheyne-Stokes respirations. He survived the procedure and lived for three weeks, to die of a coronary thrombosis confirmed by necropsy. The oldest patient to whom we have applied this principle in amputation was 86, and in his case a reamputation with refrigeration was done ten days after the first operation, because of necrosis of the flaps.

We have felt after observing the almost instantaneous loss of pain stimuli in refrigerated patients that the application of the principle could be used in other problems of peripheral vascular disease, particularly when pain is producing a spasm factor in the existing arterial blood supply. We have used it without a tourniquet in the management of a patient with early phlebitis with marked diminution in the swelling of the part and of a patient with thromboangiitis obliterans with ulceration of the toes of both feet. In the latter we

observed a marked improvement in the color of the feet and legs, disappearance of the patchy phlebitis areas, alleviation of pain and, after ten days the appearance of healthy granulations in the necrotic ulcerative areas on the toes. At the present time we have a patient who has been under refrigeration without a tourniquet for sixteen days after an embolic occlusion of the popliteal artery. We believe the striking absence of pain in this patient permits procrastination in the hope that amputation below the knee may be carried out.

From these remarks it is apparent that we are convinced a great debt is due Dr. Allen and Dr. Crossman for their reapplication of the principle of refrigeration, or hypothermia, to surgery, particularly in amputations. However, we have not been too well pleased with certain aspects of its employment. Perhaps we have been too severe, particularly with regard to the type of patient to whom the principle has been applied, but we have had trouble with our healing of the flaps. The details of the technic described by Dr. Allen and Dr. Crossman have been followed carefully, with postoperative refrigeration and elevation of the temperature depending primarily on the appearance of the wound. These measures, however, have not produced any other factors except prolonged hospitalization.

I am not qualified to discuss the application of the refrigeration principle in war surgery, but it will be of interest in the historical writings of World War II, particularly if application of this principle in the German-Russian campaign of last winter, in the same areas described by Larrey, is recorded.

This usable hypothermic principle will be particularly applicable in civilian practice in cases of catastrophic accidents, bombings or sabotage. A thorough understanding of the application of refrigeration in the treatment of mangled extremities in industrial or other accidents may be life saving and most assuredly will prevent pain and its attendant shock in such injuries.

I am grateful for the opportunity to take part in this discussion.

Dr. M. K. Newman (Detroit): Dr. Crossman and Dr. Allen should be highly commended on the type of work they have

been presenting to the medical profession in the last year. I have followed their work right from the beginning and had the temerity or the courage to carry out this particular type of work.

The first thing I think we want to straighten out is the use of the terms to designate this procedure. Dr. Shirer touched on it, and Dr. Crossman and Dr. Allen have mentioned they do not like the term "refrigeration," so I would like to propose, in line with the other terms used in general hypothermia, to call this local hypothermia anesthesia for extremity surgery.

So far as the selection of patients is concerned, there is no such thing. We always get patients in bad shape, moribund, running high fever, in shock and those are the ones we subject to this type of anesthesia for surgery. It is usually a life-saving measure and we need never have compunction about using this particular method.

As far as some of the technical difficulties are concerned, such as sloughing or improper healing of the stumps, I have had occasion to write Dr. Crossman a long letter and received a longer reply, which clearly indicated that probably the difficulties were more inherent in those who were not so well acquainted with the method and the difficulty can usually be corrected by watching the technic more carefully, both for the anesthetists and the surgeons.

Using ice or cracked ice I can refrigerate or use hypothermic anesthesia of an extremity preparatory to amputation. (Slide.) This happens to be a patient who had Buerger's, was in shock, was running quite a bit of fever and had gangrene. To carry through a low thigh amputation, rather than including the entire leg, we used part of the cuff over the thigh, but we have the tourniquet applied according to the direction Dr. Crossman gave previously. (Slide.) Just as pointed out—one can walk through the ward and see the patient a half hour after amputation, eating his supper, and with no particular trouble or pain. They go on uneventfully, show no evidence of shock and heal well. (Slide.) This is to show you the physiologic phase. Respiration, blood pressure and pulse, before, during and after the amputation may be studied. Practically no variation in the respiration, just a slight change from 20 to 25 is observed. There was no pain on the severance of the sciatic nerve, practically no change in the systolic and diastolic blood pressure. (Slide.) This really proves by blood studies on patients subjected to ether anesthesia and patients subjected to hypothermic anesthesia that the specific gravity and total protein of the blood can be studied and the normals are bound to be at 1.024 for specific gravity and for total protein are at 6. For protein, when ether anesthesia is used there would be a definite change, which is usually an elevation of total protein and elevation of the specific gravity, indicating impending

shock, yet with the use of hypothermic anesthesia no variation is found in the specific gravity or total protein elevation.

It has been a pleasure to follow out the work suggested by Dr. Crossman and Dr. Allen. I think we have something for the future, especially in traumatic and war surgery.

Dr. Lyman Weeks Crossman (Closing):

We like to get comments, but the trouble is that the fellows that do not believe us do not say so. The time that they say so is when they get me out in the hall.

The only place that I had real comment from the audience was when I was asked to go to one of the army camps to talk to the enlisted boys on this subject, as plainly as I could put it. I had more questions asked in about three-quarters of an hour than I had had, I guess, at a dozen medical meetings.

The necrosis of the flap, we feel, may be due often to surgical technic. If you separate the skin from the fascia and the fascia from the muscle you are disturbing the blood supply. If you do not separate the layers, you will have less tendency to the necrosis of the flap. We have used it a great deal for all types of peripheral vascular disease because that happens to be my specialty. The sixteen-day embolism case of Dr. Shirer was interesting. I mentioned that we had one where we used refrigeration for six weeks and he died of another embolism.

Those who insist they are doing eight-minute amputations do not fit into this picture. You can take an hour if you want, which is the usual time of anesthesia. I feel that the longer you take, the less traumatism there is and if you take an eight-minute amputation there must be a tremendous amount of traumatism to tissues that are already terribly devitalized. So I would say, sit down and take your time. Now, in all our thigh amputations we first bring about immediate disarticulation at the knee, getting the smelling thing out of the room, and then the operator sits down and takes it just as easily as a gynecologist and from there on it is not difficult. We do not hurry in any sense of the word. We have been able to introduce it into the Navy and into the Army, in one hospital of each. In the Navy, when I was talking at Bethesda, the operator said, "The anesthesia was perfect, but we got a sloughing of the stump. We followed out your technic exactly, using ice bags."

I said, "Have you told me everything?"

He said, "Yes."

I said, "You didn't put a little salt in your ice bag, did you?"

He said, "Yes."

I said, "There is your answer. You froze the part."

We do not freeze. We just refrigerate. We never get it below 40 F. You cannot freeze the part and we do not get a frostbite. Hypothermia I think does not specifically designate this part of the proce-

(Continued on Page 737)

MAKING MAN POWER

Vocational Rehabilitation of Those Handicapped by Cerebral Palsy

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Man power and woman power are at a premium. The United States government, its Army, its Navy, its Air Corps, all its agencies, the American Red Cross, all the war industries, all the private industries, are clamoring for man power and woman power. The Air Corps gets the first class nervous systems. The next best also go to the battle fronts, and the third and fourth class nervous systems are urgently needed for the tremendous job of making war equipment, for factory assembly lines, for telephone switchboard operation, for typewriting, stenography and other office work, for civilian defense duties, as well as for the simpler tasks of packing goods, sorting scrap and folding and rolling paper. In these times of shortage of man power and woman power, half a man is better than no man, a disabled citizen is valued more than in normal times and a damaged nervous system must be made to produce its utmost. The whole band of the physically handicapped become an important reservoir of potential man power and woman power.

This paper is addressed to all those in a position to take part in the rehabilitation of the more severely handicapped persons, especially those with cerebral palsy. It is an attempt to recruit physicians, nurses, physical therapists, occupational therapists, teachers and parents in an all out effort to face the national need for man power and examine objectives and methods of all phases of the rehabilitation of the handicapped.

From the standpoint of rehabilitation, handicapping disabilities can be divided into five main groups: motor handicaps, sensory handicaps, mental handicaps, circulatory handicaps and respiratory handicaps. Motor handicaps indicate interference with muscles and nerves, causing a disturbance in strength and coordination of movement, such as occurs in poliomyelitis and cerebral palsy. Sensory handicaps include difficulty in sight, hearing, sensation, smell and taste. Mental handicaps comprise all deviations from the normal due to psychic disturbances. Circulatory handicaps include principally the cardiac diseases, while the respiratory group is made up mainly of cases of arrested tuberculosis. Since defense industry is fast absorbing the less handicapped workers, it is among the more severely handicapped of the motor disability group that man power for rehabilitation is to be found. In fact, it is primarily those handicapped by cerebral palsy who are now presenting themselves for rehabilitation.

Problem of Those Handicapped by Cerebral Palsy

Statistics have it that there are 1,500 births per year per 100,000 population, and that 7 of the 1,500 infants have cerebral palsy. Six of the 7 live, but since 2 are feeble minded, only 4 are treatable. In a city the size of New York there are approximately 280 new cases of treatable cerebral palsy each year, while there are between 3,500 and 4,000 children with cerebral palsy under 16 who

would benefit by treatment and probably many more than that number over 16 who have possibilities for rehabilitation.

Children with cerebral palsy are born with damage to the brain centers controlling coordinated movement. They cannot make normal coordinated movements, so they must be taught how to perform purposeful movements by working through their peculiar time-consuming, roundabout habits of movement. These are the young people who are stumbling, limping, dancing and jiggling their way to the Institute for the Crippled and Disabled for vocational training. They come out of hiding, somehow sensing their chances and their possible usefulness, seeking help, demanding advice. What can be done for these boys and girls, and what can they do for their country? These unguided young people and their parents need advice of a direct and authoritative nature. Their ambitious mothers may want them to finish high school, perhaps even go to college. But in many cases the attempt to compete with normal children results in emotional handicaps exceeding the physical ones. The child and his parents should be urged to weigh reality carefully and demand only what is possible in view of the child's condition and the social circumstances under which he must live. It may be advisable for a boy or girl of 16 who is well adapted to school to finish high school. It may even be that he should go to college if his parents have the means and if provision for his future is certain. However, the majority of these boys and girls should never contemplate college, since college expenses can only be a serious drain on their families and after they have finished they can rarely be expected to attain professional success without much outside help. Many are the stories of the ones who have studied law, sociology or economics, only to find that they cannot be employed. Their intelligence may be far above normal, yet with their odd facial expressions, speech defects and inability to write plainly or even fold a sheet of paper, they find that their specialized training is of little value. In most cases college training would be a waste of time and money, since the child would finish no better off vocationally than he was before. Much more practical would be an effort to find out what each boy and girl can and cannot do and then select a trade which he or she can learn. It is only through some such logical procedure that those with cerebral palsy can learn to be useful, make their places in society and acquire some degree of happiness.

The Institute for the Crippled and Disabled is a vocational training school where trades are taught to those selected as having sufficient possibilities for placement after training. In addition to the training classes, there is also the sheltered workshop. From those who are too severely handicapped ever to compete with normal workers in industry are selected the ones who show promise of possible good workmanship at simple tasks. These are given places in the sheltered workshop, where they can earn money commensurate with their accomplishment. It is urged that the school, hospital and parents face all the issues involved in counseling young people with cerebral palsy and that they encourage them to avail themselves of dependable vocational guidance and training.

Necessity for Objectives

Those interested in cerebral palsy have folders filled with methods of treatment, some good but many of little value. There is a strong need today for a central clearing place for the evaluation of publications on cerebral palsy. From first-hand experience with the various methods used in the treatment of the manifestations of this condition, it seems conclusive that Dr. Winthrop M. Phelps, of Baltimore, has developed the best methods, and it is to him that those interested in cerebral palsy should look for guidance as he publishes the results of his findings at his Children's Rehabilitation Institute, at Cockeysville, Md.

It is not enough, however, that treatment should improve the neuromuscular system of the subject in a general way. To justify itself treatment has to have

specific and practical value and be worth while from the standpoint of time and the life of the subject. The objectives of the treatment in terms of a useful life to be lived must be clearly envisioned. In treating or teaching a child with cerebral palsy the following practical questions should be kept in mind: What does the future hold for this child? When his parents are no longer able to care for him, what will become of him? Is he personally independent? As he grows older and has gained his maximum benefit from treatment, what vocation is to be advised for him? Can he ever become self supporting? During the last year over a hundred persons with cerebral palsy made personal application to the Institute for vocational rehabilitation. Many of them were high school graduates and had been under treatment in special schools and clinics, yet some of them could not be admitted for vocational training because they lacked some essential requirement which should have been taught them during their childhood by those in charge of their treatment and education.

What are the factors essential for vocational rehabilitation? To be trained for a vocation and be placed in industry or in a sheltered workshop similar to that of the Institute, the applicant must (1) be able to walk and to travel, (2) be able to take care of himself as far as handling wearing apparel, eating and bathroom necessities are concerned and (3) have some use of his fingers, for all trades require finger movements.

Locomotion and Transportation.—The applicant must be able to walk. He must be able also to use the various conveyances for transportation, otherwise he will be home bound. Traveling involves going up and down curbs, getting in and out of buses, going through revolving doors and subway turnstiles and going up and downstairs. In addition, the applicant must have sufficient speed in his movements to be able to cross the street on a green light. If he is a crutch walker, he should know all the types of crutch gaits, so that he can use the one appropriate to the demand. Many applicants give a past history of the best treatment at the best hospitals and the best educational background, yet cannot cross a New York street on a green light because they are accustomed to saunter across suburban streets using the orthodox four point crutch gait. The future predicament of these boys and girls in a big city was not understood.

Such essentials are much more easily learned early, and consequently they are most appropriately taught by those managing the handicapped in hospitals and schools. When these essentials have been neglected, the period of vocational training is unnecessarily prolonged. The Institute is meeting the problem by developing a physical achievement test apparatus which indicates the applicant's ability to travel. This apparatus has steps of varying heights to represent bus, subway, and curb steps, a turnstile and other devices simulating actuality. In addition to their vocational training, many Institute students receive instruction in the faster crutch gaits, as well as in methods to improve their traveling facility. An example is a boy with muscular dystrophy who was not able to get up the high city curbs. He has been taught to walk along the street until he comes to a water plug or street light and then pull himself up the curb by grasping the pole with his hands.

All treatment and education should be conducted with the aim in mind of making the subject more independent. All over the country children—many large and heavy—are being carried to buses in the arms of tired mothers who hold them on their laps, carry them off the buses to the therapists for treatment and then carry them home again. A physical achievement test and practice should be given to each child to see that he learns to accomplish to the extent of his disability all the methods of traveling.

Self Care.—The subject must be able to care for himself. Only this month a 20 year old youth with spastic quadriplegia was examined after admission to the testing class at the Institute. His condition was moderately severe, yet he

could walk adequately and gave every appearance of being able to take care of himself. He removed his clothes after a great deal of effort and at the conclusion of the examination was told he could get dressed again. It was pitiful to notice the efforts of this young man in his attempts to dress himself. It was impossible for him to button his shirt or trousers, and in the end he had to have help to make himself presentable. His method at present is to get into the elevator alone and when the operator closes the door to ask him to do the necessary buttoning. This boy had been graduated from high school, and a letter from a clinic indicated that he was ready for vocational training. It is evident that his mother dresses him each day. No one giving him treatment had ever considered it necessary for him to learn to care for himself. No suggestion had apparently been made that he wear clothing with zippers, which he could learn to manipulate.

Especially in the matter of eating, these children must be disciplined early to help themselves. They must not be allowed to arrive at the age of 18 and not have enough tricks of the trade to get through a complete meal. All children will soon take advantage of too much help. An oversolicitous mother learned quite by accident that her 14 year old daughter, on whom she had been spending an hour and a half at every meal, fed herself in twenty minutes under motivating circumstances.

The movements necessary for buttoning shirts and trousers and tying shoelaces and neckties, and the motions required for eating, should be made a definite part of the therapeutic exercise program, as these activities are absolutely essential for vocational rehabilitation. Parents too easily get into the habit of helping their handicapped little ones at every turn, with the result that they become more and more dependent as they grow older. The parents should be educated to the point where they are willing to encourage the child to do everything for himself, and they must be willing also to be patient and wait for him to accomplish his tasks. They need to learn, too, to control their fear that he may fall or hurt himself in his efforts. These children will fall far more often than normal children. Consequently they have more experience in falling and are likely to attach less importance to a fall than do the parents. It is the task of the physician, therapist and teacher to instruct the parents how to make the child independent, and the earlier this is begun the better prepared the child will be when he is of an age to be vocationally trained.

Use of the Fingers. — Vocational rehabilitation depends largely on the extent to which the hands can be used to produce purposeful movements. The procedure of spending years training a handicapped child to perform movements at the shoulder and elbow joints has no commercial value if the child cannot use his hands. Vocational rehabilitation depends on coordinated and controlled movements of the wrist and fingers, while shoulder and elbow movements are of secondary importance.

Injuries to the brain such as those found in cerebral palsy produce many and varied types of motor disabilities in the hands and fingers. In the case of the spastic type of cerebral palsy, which is characterized by definite muscle imbalance, an operation may be the practical move. While the patient with the spastic paraplegic type of disability offers no particular problem with regard to the hands, since the difficulties are limited to the lower extremities, the one with the spastic hemiplegic type is extremely difficult to train, especially if the spastic arm has a flexed wrist. It is impossible to use the fingers if the wrist is flexed, and consequently the whole arm may be practically useless. Working out the contractures and giving the proper exercises may be the work of years, while the practical step would be an operation to fuse the wrist. Even if the fingers are not used much after the operation, the hand can be used to hold, press, push and pull.

A boy of 17 with right hemiplegia was struggling along in the office practice class, attempting to learn one hand typing, since his right arm was badly handicapped by a contracted wrist in flexion, with no power of supination and with drooping powerless fingers as a result of the position of the wrist. The wrist was fused, and therapeutic exercises were given to stretch the contracture at the elbow and endeavor to obtain supination. Six months after the operation the mother reported that the boy was in a WPA radio school, where he found that he could use his hand adequately. The operation made the difference between a phlegmatic, somewhat discouraged lad with little vocational promise and a motivated boy with enthusiasm and ambition who will undoubtedly find a place for himself vocationally.

The subject with spastic quadriplegia has been considered virtually hopeless from the standpoint of vocational training. Yet such persons can be made productive in a limited way under conditions similar to those in the sheltered workshop of the Institute. A classic case is that of a boy of 16 who entered the Institute slung over his father's shoulders. He passed from the kneeling position stage through the walker stage and now manages to travel with two crutches and a unique pair of long leg braces which it took a man outside the brace profession to devise. After a long period filled with many trials and great discouragement, the boy mastered some of the simpler types of workshop activities. Any day he can be seen doing a folding and inserting job or rolling tissue paper or putting yellow daisies together—a perspiring animated worker with a watch always beside him, trying to beat his own record. He is learning to do the harder operations, such as working with cellophane and some of the more fragile materials. It has been found that in general the person with the spastic type of cerebral palsy tends to exhibit greater care and accuracy in handling materials and less difficulty in controlling pressure than the person with the athetoid type.

This, then, is what can be done with kindness and an understanding of the condition, by graduating the simplest activities and by teaching the subject in a manner in keeping with the treatment principles set up by those who know most about cerebral palsy and its many different manifestations.

For persons with the athetoid type of cerebral palsy the possibilities of vocational training for industry have so far been exceedingly limited. Yet their hands, too, can be made to be useful at some of the simpler tasks. They should be taught early to use the hands and fingers in a relaxed manner to perform simple tasks, such as folding paper and gross pasting. They find folding paper an easier task than rolling paper. The rolling procedure requires a light touch, and, because of the difficulty they have in controlling pressure, they have a tendency to squeeze and mash the rolls, making them unsuitable for commercial use. This does not mean that they cannot learn to control their pressure, for there are many surprises in the field of cerebral palsy. It means that the simple skills should be taught early, so that when these handicapped persons come of age vocationally they need not be held back by a lack of such elementary skills.

The subjects with tremor present great difficulties. Their major trouble is in holding materials firmly. The performance of any new task is accompanied by excessive motion. Since this is essentially true of all persons with cerebral palsy, it would seem that they all should have plenty of practice in simple operations, such as folding textiles or clothing, rough paper, cards and shiny paper, pasting materials together, measuring and cutting and drawing straight lines, so that all these operations are familiar when they arrive at the stage of vocational training. Even if it takes five pairs of spastic hands to accomplish what one pair of normal hands could do in the same time, at least the normal pair is released for more difficult work. Because all hands are so urgently needed nowadays, the Institute is initiating an experiment to discover ways by which persons with right hemi-

plegia and persons with left hemiplegia can work together in teams on some types of assembly line work.

Further Considerations.—In addition to the three fundamental requirements of traveling, self care and the use of the hands, four more considerations are important for vocational rehabilitation: speech, hearing, eyesight and general appearance. Persons with cerebral palsy are likely to have a combination of speech, hearing and eyesight defects, as well as facial grimaces which may detract from their general appearance. The degree to which these defects are present will affect the possibility of their being absorbed by industry. Only extremely handicapping combinations of these conditions, however, would prevent such activities as are performed in the sheltered workshop.

Vocational Guidance

The field of vocational guidance of boys and girls with cerebral palsy is greatly narrowed by the serious handicapping features of the condition. There is not the wide choice of vocations enjoyed by the average young person. There are many occupations that can never be attempted and only a few that can ever be accomplished. Consequently, study of an exact nature of the total boy or girl must lead to definite recommendations as to vocation, often with no alternatives. A description of the procedure followed at the Institute for the Crippled and Disabled is included, in the hope that those interested in the vocational guidance of boys and girls with cerebral palsy may be helped in their efforts.

Each applicant is asked to report for an interview. During that interview the hopes and desires of the applicant are discussed, he is questioned on how he traveled to the Institute and his ability to care for himself and a few simple tests are given him to learn what he can do with his hands. Observations are also made of his general appearance, his speech, his hearing, his eye movements and any unusual gestures or tremors. After this interview an estimate is made of the possibility of vocational training. If the applicant is acceptable for trial, he is given a seventeen day period of testing in the guidance test class.

There are eleven trades taught at the Institute, and at various times in the sheltered workshop there are some forty types of production work, such as making dresses, rolling paper, making artificial flowers, collating games and packing cigars, matches and razor blades. All the trades taught at the Institute and all the different activities performed in the sheltered workshop have been analyzed into separate operations. These have been broken down into separate movements and the various operations then graded according to ease of performance. During the test period the applicant is put through a progression of these operations from the most simple to the most complex, and a record is kept of his success in achievement. The record keeping is based on the attainment of perfection of a given task and the time necessary to accomplish it. With the use of a metronome or a stop-watch, a check can be made at any time on the speed of accomplishment of an operation, or task by any applicant. The Institute staff consists of expert craftsmen from the trades and a full time staff, including a director, a registrar, psychologists, a physician, a physical therapist, an occupational therapist, a speech therapist, a guidance counselor, welfare and social workers, an educational director and a placement secretary. While the applicant is in the guidance test class these specialists study him by means of psychologic examinations; a medical examination; movement, gait and physical achievement tests; a speech test; discussion of his recreational interests; a social welfare visit to his home; an educational and work history, and interviews with trade instructors and the employment secretary. At the end of the period in the guidance test class a summary of findings is written, the case discussed at a staff meeting and recommendations made. The recommendations may lead to transfer from the guidance test class to the sheltered workshop, where the worker is paid

according to the amount of work he can accomplish satisfactorily in a given period of time. Or the recommendations may lead to transfer from the guidance test class to one of the trade training classes, in which case the student pursues his vocational training to its completion and receives his vocational certificate at the graduation exercises held each June. At that time every effort is made to have him join the large group of Institute boys and girls and men and women now employed in private industry and in war jobs. A summary of the case of a recently accepted young girl with the athetoid type of cerebral palsy is appended to illustrate the procedures followed at the Institute.

Follow-up studies on all boy and girl graduates are made in an effort to discover reasons for the success or failure of those trained at the Institute. The information obtained is revealing methods for improving the vocational rehabilitation procedures now in use. The success or failure of the graduate is not always found to be associated with his disability. A home condition, lack of finances or an emotional or social problem may be partially responsible, or the graduate may have been led to believe that his intelligence and aptitude were higher than they are. Seventeen per cent of Institute applicants have passed grade levels in school beyond their mental capacity. A moron has not the mental equipment to finish high school, yet often there are some such high school graduates among those making application to the Institute. This can only mean that some teachers have allowed their emotions to predominate, thus unintentionally complicating the pupil's life later on. It is urged that teachers try to deal honestly with their handicapped pupils.

Vocational rehabilitation of the handicapped is the problem of special institutions prepared to study the total individual and give vocational guidance. It takes many months and is often impossible to heal the mental trauma produced by repeated failures in vocations which these people may have tried and for which they were not adapted. It would be a much greater service for well meaning teachers, parents and friends to refer children with cerebral palsy to special vocational institutions for advice rather than to inflame these impressionable and energetic handicapped children to attempt tasks beyond their capacities. On the other hand, it should be the definite responsibility of schools, hospitals and homes to prepare children with cerebral palsy to travel, to care for their personal needs and to develop the use of their hands to their maximum extent in anticipation of future vocational training. All knowledge, resources and ingenuity need to be pooled toward evaluating accurately the usefulness of these forgotten Americans in our present acute need for man power and woman power.

Sample of Summary of Findings*

The applicant, M. G., is a white girl 17 years of age, born June 25, 1925 in New York of American parents, who was referred to the Institute for training by her public school teacher.

I. *Interview.*—The applicant has applied (Aug. 14, 1942) for trade training in any work considered suitable for her, as she is eager to make her own way. She is very young, immature and frail looking. A speech defect and a general body tremor are noticeable. Her hands show unsteadiness and are limited in use. She is neat, frank, polite and of a retiring nature. It is recommended that she be accepted for a tryout in the guidance test class subject to the approval of the physician.—REGISTRAR.

II. *Bell Adjustment and School Inventories.*—The total adjustment inventory score is unsatisfactory. An analysis of the applicant's total responses in terms of health, social, emotional and home adjustment reveals the following scores: The health adjustment is unsatisfactory. Colds, eyestrain and fatigue at the end of the day bother the applicant. She considers that she has been ill a great deal of the time in the past. She seems unable to specify any definite present symptoms except colds. She is underweight. The social adjustment is average. Her responses indicate that she is timid, sensitive and selfconscious of her appearance. The emotional adjustment is unsatisfactory. The answers indicate that the applicant considers that she is fearful, easily discouraged and depressed, sensitive and quick to anger.

* A complete set of the forms used may be had by applying to the Institute for the Crippled and Disabled, 400 First Avenue, New York.

The home adjustment is average. The applicant believes that her mother tends to dominate the home. There are quarrels with her sisters and quick anger displayed on the part of one of her parents. She believes she is not understood by one of her parents. She tends to be uncertain on the subject of family relationships and her own affection for her parents. The school inventory score is good.

Examination of the responses shows that the applicant's scores have been greatly influenced by her disabilities. All the health maladjustments are to be expected, since persons with cerebral palsy are more subject to respiratory disturbances and tire more easily than the normal, and tend to be thin. The social and emotional adjustment inventories disclose a marked tie-up with disabilities, since these would be greatly responsible for selfconsciousness and fear, while quick anger is a characteristic of the athetoid personality. The home adjustment inventory reveals the possibility of lack of proper management of the applicant at home, which may be responsible for her immaturity and sense of uncertainty. It is recommended that the applicant be encouraged to participate in all Institute programs, especially group activities, such as group singing and dancing, as well as in outside club activities. — PSYCHOLOGIST.

III. *Medical Examination.* — History: Both parents and three sisters are living and are in good health. The applicant was born with a condition diagnosed as spastic paralysis and has always had difficulty in the use of her extremities and in speaking. She has been under the care of a private physician and received treatment at five New York hospitals. An operation was performed on her navel at the age of 6 months. She had scarlet fever at 2 or 3 years of age and diphtheria at 6 years of age. Her tonsils were removed at the Polyclinic Hospital at the age of 8 years. Other hospitals attended were St. Vincent's Hospital, the Roosevelt Hospital and the New York Orthopedic Clinic. She has had difficulty with her eyes.

Findings: She is 58 inches tall and weighs 91 pounds. She is of the athletic body type, and her general appearance and expression response are good, although there is almost constant grimacing of a mild type. Her arms, hands, face, head and neck are mildly involved in the handicap and exhibit involuntary movements and overflow. Her thighs, legs, feet and toes are negligibly involved in the handicap, although her feet are markedly pronated, for which condition she wears arch supports. She has a left lumbar scoliosis of a functional type. Her gait is slow, slightly guarded and awkward but essentially symmetric (see gait test). There is malocclusion of the teeth, and her speech is thick and inaccurate, though she is readily understood (see speech test). There is partial deafness. There is limitation in lateral movement of both eyes in both directions, but no nystagmus or strabismus is present. There are near sightedness, which has been corrected by glasses, and a tendency toward wateriness of the eyes. Her muscles give the appearance of being well developed (see muscle test). Ability to move at will is fast. Relaxation is poor. Spasticity is absent. Incoordination is present in both extremities, as evidenced by point tests, and is more marked on the left. The tendon and skin reflexes are all normal, and no ankle clonus is present. Diet, exercise and sleep are adequate.

The diagnosis is congenital cerebral palsy of the athetoid type. The prognosis is good. The degree of handicap is mild. It is recommended that she procure Thomas orthopedic heels for her shoes with $\frac{1}{4}$ inch wedges to aid in overcoming the excessive pronation of the feet. — PHYSICIAN.

IV. *Movement, Gait and Physical Achievement Tests.* — Movement Test: In general the musculature all over the body presents a varying amount of weakness. The musculature on the entire left side is weaker than on the right. All joint motions can be performed and are accompanied by mild involuntary motion and overflow in the face, head, neck, hands and feet. The motions which seem to be the most unfamiliar and unused are pronation of the forearm, dorsiflexion and palmar flexion of the hand, abduction and adduction of the fingers and external rotation of the thigh. She is right handed, and whenever possible she uses one hand only, preferably the right hand. One-handed activities are simpler for her to accomplish than two-handed activities. She grasps well with her thumb and fingers. Her aim is good in placing objects such as marbles in depressions or dowel sticks through holes in a box or in rolling a ball to knock down pins. She rolls a ball under-hand and does not use her wrist. When cooperation of the two hands is necessary, as in buttoning, cutting and folding, the achievement is comparatively poor. All these activities are accompanied by mild involuntary movements of the face, especially of the lips, head, neck and arms, and she holds her head bent forward during all activities. There is tightness in her hands as she works which increases with the newness of the task. She tends to raise her shoulders when trying to accomplish an activity. She has no difficulty with standing while working. The most outstanding characteristic in her movement habits is the lack of use of her wrists.

Gait Test: The gait is slow, easy, somewhat awkward and careful and essentially symmetric, although she toes out and her longitudinal arches are down. She leans forward slightly at the hip joints and carries her left shoulder high. Her arms are carried down at

her sides and exhibit slight involuntary movements while she is walking, as do her head and face. Her balance is somewhat precarious, as she seems fearful of falling and reports that she does fall easily. She states that her left side is her worse side.

Physical Achievement Test: With regard to activities involved in self care, the applicant is capable of performing all activities adequately, except that of carrying a cafeteria tray. This is impossible because of unsteadiness and involuntary movements. Walking on all types of surfaces for speed and endurance, as well as sitting down and rising from a sitting position, is performed adequately. Travel involving the use of all transportation facilities is satisfactory. The use of the hands in everyday activities is slow but adequate, except in the use of a typewriter. This is difficult.

It is recommended that the applicant be taught progressive relaxation to reduce the involuntary motion of face, head, neck, arms and hands; be guided in special individualized activities of the hands accompanied by instruction in differential relaxation to reduce athetosis, free the wrists and improve and strengthen the coordination of the fingers; be taught balancing exercises to give greater certainty of balance and reduce falls; be given instruction in posture and body mechanics to increase efficiency of gait and everyday movements, and be provided, while at work, with special instruction which will utilize all the valid principals of treatment of cerebral palsy as applied to her chosen line of work, in an effort to integrate worker and work. — CEREBRAL PALSY TECHNICIANS.

V. Speech Test.—The speech pattern is abnormal in both articulation and phonation. There is limited mobility of tongue and lips, resulting in sibilant distortions, and the vocal flexibility is also impaired. A hearing loss at a high pitch range is present because of the absence of voiceless consonants. The degree of speech disorder is moderate, the prognosis is limited, but the condition is treatable. It is recommended that the applicant have an audiometer test, progressive exercises for reeducation of the tongue and lip muscles, and breathing and voice drills. — SPEECH THERAPIST.

VI. Recreational Interests.—There is little or no social life outside the narrow family circle, and the applicant's interests and recreation are confined. Her favorite recreations are reading the "funnies," playing cards ("rummy") with the family and going to the movies twice a week. She expressed interest in the following recreational activities at the Institute: table games, music, swimming and volley ball. It is recommended that the applicant be interested in group activities and encouraged to join the dancing class as well as the activities in which she is interested. — GUIDANCE COUNSELOR.

VII. Social Welfare Home Visit.—The home is good. Since the income is equal to or slightly above the needs of the standard budget, no Institute help is needed. Food and clothing are sufficient. The applicant says she is happy at home, and any disagreements arise from the ordinary difficulties of sisters. Although her mother seems to have an essentially sane and wholesome attitude toward the applicant's disability, nevertheless she tends to shield her daughter's timidity, giving the impression that she is less introverted and less concerned by her disability than she really is. The supposition is that the mother may unconsciously dominate the child somewhat. The result seems to be that the applicant is a little confused and wavers in her feelings, emotions and ideas. This is likely to be the explanation of some of the inconsistencies found between the Bell inventory responses and discussion of the matters with the girl and her mother. The mother has recently been worried about the fact that her daughter's right shoulder tends to drop and that she slumps over when sitting, so she has bought her a corset in the hope of correcting this. It is recommended that the home be visited again, a further effort made to verify the family relationships and the mother cautioned to allow her daughter to express herself with less interpretation on her part so that the girl can find herself and grow up. It is further recommended that the corset be approved by the physician if found necessary. — SOCIAL WORKER.

VIII. Educational and Work History.—The applicant attended Public School No. 54 in a special class until she reached the fifth grade at the age of 15. She next attended St. Joan of Arc School and stayed for two years, completing the sixth grade in June, 1942. She has never had any work experience. — EDUCATIONAL DIRECTOR.

IX. Stanford-Binet Intelligence Test.—The applicant scored an intelligence quotient of 74 and a mental age of 11 years and 2 months, which placed her in the borderline intelligence group. The clinical impressions were as follows: She was willing and attentive and reacted pleasantly to the test situation. Although she was cooperative throughout the greater portion of the test, she rapidly lost her self confidence at the 14 year test. It is believed that she could have done a little better if she had not been so timid and had better auditory and visual acuity and better use of the fingers for fine movements. These deficiencies proved to be a handicap to her when time tests were required. — PSYCHOLOGIST.

X. Guidance Test Class.—The applicant was tested in twenty tasks involving the use of the upper extremities, with the following observations: Under the strain of accomplish-

ment her posture suffers, her shoulders tighten and are elevated, her head strains forward and she tends to roll her eyes to the tops of the sockets and stare fixedly at her work with her head bent down. All work is accompanied by mild involuntary movements of the face, head, neck, shoulders and hands. Her accuracy in movement tends to be adequate until she gets tired. Her speed is estimated as being 35 per cent of that of so-called normal. She has an intelligent approach to her work and is industrious but tires readily.

Although the percentage of perfection attained in the tasks of measuring, cutting and tracing was between 80 and 100, she was found to be too unsteady and weak for adequate performance of the remaining tasks required for entrance into a trade training class. The percentage of perfection which she attained in the simpler tasks of folding papers of different sizes and qualities and advertising folders, sorting and counting playing cards, inserting advertising material in folders and counting, folding and banding tissue paper, was between 75 and 95. It is recommended that she be transferred to the sheltered workshop to undertake any simple tasks commensurate with her ability, since her involuntary movements, unsteadiness and slowness have prevented the accomplishment of the finer, more precise activities required in learning a trade. — GUIDANCE TEST CLASS INSTRUCTOR.

XI. *Trade Instructors.* — The consensus of the instructors is that the applicant is not trainable because of her inability to perform precise movements. — TRADE INSTRUCTORS.

XII. *Placement Secretary.* — Placement would be difficult if the applicant learned a trade, because of her youth, because of her eye, ear and speech disabilities and especially because of the involuntary movements of her head, neck and arms. Her speech defect and general body tremor would make a substantially negative impression on an employer. — PLACEMENT SECRETARY.

XIII. *Recommendations.* — The psychologist's recommendation is to encourage participation in group activities. The physician suggests Thomas orthopedic heels for the applicant's shoes, with $\frac{1}{4}$ inch wedges, to aid in overcoming the excessive pronation of the feet. Physical and occupational therapy should include instruction in relaxation, special programs involving hand activities, balancing exercises, posture and body mechanics and vocational therapy under working conditions, all as indicated. Speech therapy should cover an audiometer test and lip, tongue, breathing and voice exercises. The social worker recommends that the home situation be further studied so that the applicant may be encouraged to clarify her own reactions independently of her mother to an extent more in keeping with her age. — STAFF.

XIV. *Vocational Indications.* — From the standpoint of locomotion and travel, there is no problem, since the applicant walks and uses all transportation conveyances successfully. Regarding self care, there is no difficulty, since the applicant can manage the essentials adequately. With respect to the use of the fingers, she is handicapped markedly by involuntary movement, weakness and lack of precision and speed. She can only be expected to perform tasks requiring the more gross movements, such as folding and banding paper, inserting advertising material into folders, collating games, packing objects and similar simple tasks, and these tasks must be performed with the understanding on the part of the employer that her normal speed is 35 per cent of that of a so-called normal person. Her youth, speech defect and general body tremor would be disadvantages in applying for any type of work. Her involuntary movements, though mild, and her quick fatigue will interfere markedly with any type of work attacked, while her eye and ear difficulties, though also mild, may constitute relatively minor deterrents in the matter of her performance speed. It is recommended that the applicant be transferred from the guidance test class to the sheltered workshop to undertake only those simple activities which her guidance test class accomplishments indicate she can achieve. — EDUCATIONAL DIRECTOR.

XV. *Disposition of Case.* — After seventeen days in the guidance test class, the applicant was transferred to the sheltered workshop on Sept. 10, 1942, as recommended by the educational director. It is possible that, with treatment, instruction, practice and familiarity with sheltered workshop activities, the worker's coordination, accuracy, strength and speed may improve to the extent that she can undertake more difficult work in due time. In any case, every attempt will be made by all members of the staff to guide this young-athetoid girl to her maximum individual and social development.



PRESENT STATUS OF ELECTRICAL STIMULATION OF DENERVATED MUSCLE *

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A careful survey of the literature shows there is no agreement as to the value of electrical stimulation for the denervated muscle. However, certain general observations can be made. Favorable results have been reported when the investigator not only obtained vigorous contractions but, in addition, produced a large number of contractions daily. Langley¹ is the single exception. On the contrary, those who have used weak stimuli or have given short periods of stimulation have reported unfavorable results. Moreover, those investigators who have attempted to adapt their stimuli to the changing excitability of the degenerating muscle have been more successful than those giving no attention to this important factor.

There are two diametrically opposed views as to the cause of atrophy in denervated muscle, namely, the atrophy of disuse and the atrophy of exhaustion. The theory for atrophy of disuse is supported by two types of evidence:

1. According to Tower^{2,3} muscles which have an intact nerve supply but are functionally inactive because of immobilization in plaster, tenotomy or isolation of the efferent innervation from all afferent stimuli will undergo atrophy.

2. Contraction of denervated muscle either by passive motion or by active contraction produced by electrical stimulation will, according to Fischer,⁴ Solandt and Magladery,⁵ Kowarschik and Nemec⁶ and Guttmann and Guttmann,⁷ prevent or delay atrophy.

That denervation atrophy is simply a disuse atrophy, however is contradicted by the following evidence:

1. The atrophy of denervation, and the atrophy of disuse, although grossly indistinguishable, are histologically different, which indicates that the two processes are related but, according to Tower,² not identical.

2. Actually, denervated muscle is not at rest but is in a state of continuous, fine, irregular fibrillation. Functionally inactive muscle with intact innervation does not fibrillate. This fibrillation was first described by Schiff,⁸ in 1851, and has more recently been studied by Solandt and Magladery,⁵ Langley and Kato⁹ and Hayes and Woolsey.¹⁰ Langley¹ and Hartman and Blatz,¹¹ failing to demonstrate any beneficial effect from passive motion or electrical stimulation, suggested that denervation atrophy is fatigue atrophy resulting from continuous fibrillation. Tower,² who in 1939 reviewed the literature, also supported the fatigue theory of atrophy. The evidence which may be cited in support of this conception is as follows:

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¹ Read at the Twenty-first Annual Session of the American Congress of Physical Therapy, Pittsburgh, Pa., September 10, 1942.

1. Langley¹ has shown that denervated frog muscle does not fibrillate; neither does it atrophy.
2. According to Langley and Itagaki¹² and Knowlton and Hines¹³ the oxygen consumption of denervated muscle is greater than that of normal muscle.
3. Levine, Hechter and Soskin¹⁴ stated that the biochemical changes accompanying atrophy are those characteristic of fatigue.
4. In the denervated gastrocnemius muscle of the rat, Levine, Goodfriend and Soskin¹⁵ found that prostigmine increased fibrillation and also increased the rate of atrophy, whereas atropine, which diminished fibrillation, decreased the rate of atrophy markedly. Their results, however, are not in agreement with those of Solandt and Magladery,⁵ who stopped fibrillation with quinine and failed to observe any decrease in the rate of atrophy.
5. The time of onset of fibrillation coincides with the beginning of atrophy and the biochemical changes of fatigue.

If denervation atrophy is due to exhaustion, the contraction of muscle by electrical stimulation certainly appears to be contraindicated. However, it is possible that electrical stimulation may be of value in other ways than in the production of contraction; it may decrease or abolish fibrillation or it may increase blood flow through the muscle and improve its nutrition. The work of Solandt and Magladery⁵ and Hartman and Blatz¹¹ would seem to indicate that electrical stimulation has little or no effect on the fibrillation of denervated muscle. As far as we know, no one has studied the effects of stimulation per se (i. e., independent of contraction) on actual blood flow.

A great deal of information has been presented in the physiologic literature regarding the electrical excitability of muscle as well as the mechanism by which muscular contractions are graded in strength. Much of this information has apparently been overlooked by clinicians interested in electrodiagnosis or electrotherapy.

When we speak of the electrical excitability of muscle, we immediately encounter difficulties. If electrodes are applied directly to a muscle with intact innervation, the muscle is not stimulated directly, but indirectly through its nerve. Hence, unless curarization is performed or single fiber preparations are used, or latent period measurements are taken, it is probable that most so-called direct stimulation of muscle is actually indirect stimulation.

The response of an irritable tissue, such as muscle and nerve, to an electrical stimulus depends on several factors: (1) the form of the current, that is, its rate of rise di/dt ; (2) the current intensity and (3) the duration of current flow. Each of these factors has been employed in study of the electrical excitability of muscle. The most widely publicized test involves the study of the intensity-duration relationship and determination of chronaxie. This conception of a universal time factor in excitation was introduced by Lapicque. Chronaxie is defined as the least effective duration of a stimulus whose intensity is twice the rheobase. The familiar clinical test of Erb is an application of the strength-duration relationship. The loss of excitability of a denervated muscle to a tetanizing (faradic) current is an expression of the fact that its chronaxie has been lengthened. Chronaxie has been used clinically as a measure of excitability for the study of denervated muscle. However, Lapicque's original conception has been largely qualified. For example, it has been found that the chronaxie will vary with such factors as size of electrodes, position of electrodes and distance between electrodes.

Lucas¹⁶ and Rushton¹⁷⁻²⁰ have shown that at least two distinct strength-duration curves can be obtained from muscle under certain experimental con-

ditions, the so-called alpha and gamma excitability. They have identified the alpha curve with muscle and the gamma curve with nerve. They also believe they are able to demonstrate a third, or beta, curve, which they associate with the neuromuscular junction. The muscle curve is characterized by a chronaxie ten to one hundred times that of its motor nerve. It is interesting to note, however, that the rheobase value is less for muscle than for nerve. Theoretically, it is predictable, according to Blair,²¹ that a lengthening of chronaxie will be accompanied by a decreased rheobase unless a change in threshold occurs. Hence, a slowing of excitability in the ordinary sense (i. e., lengthening of chronaxie) is accompanied by a lowered rheobase. This means a decreased irritability to currents of short duration and an increased irritability to currents of long duration. This relationship is apparent in the alpha and gamma curves of muscle. It is also apparent in the strength-duration curves of muscles at different temperatures. Lapique originally denied the existence of the alpha curve but later reversed his opinion; he²²⁻²³ still denies, however, that the alpha curve is a true strength-duration curve, and states that chronaxies measured on it are false chronaxies.

At present no well controlled study of the strength-duration curve throughout the course of atrophy has been presented. The available evidence, however, indicates that the short chronaxie of normal muscle is abruptly replaced, without preliminary modification, by a lengthened chronaxie ten to one hundred times the normal.² It is possible, therefore, that the lengthened chronaxie which appears rather suddenly represents the true muscle excitability of Lucas and Rushton. The research of Rosenbleuth and Dempsey²⁴ supports this conception. These authors reported that no change occurs in the chronaxie of nerve during the first four days following section; but after the first four days neuromuscular transmission suddenly ceases. Reports do not agree relative to the rheobase changes occurring in denervated muscles. Theoretically one would expect a decrease. A less well known test of muscle excitability is study of the threshold-time of rise function for linear rising currents of different slopes. Such currents were extensively studied by Lucas,¹⁶ Fabre²⁵ and Blair.²⁶ Their employment in diagnostic testing in peripheral nerve injuries has recently been suggested by Bauwens.²⁷⁻²⁸

A third method of studying electrical excitability is determination of the strength-frequency function. This has been studied extensively on normal muscle and nerve by Hill, Katz and Solandt,²⁹ Achelis,³⁰ Katz,³¹ Lullies³² and Coppée.³³ It would appear that this type of test has a more direct bearing on the choice of current for stimulation than any other. Yet it has not been applied clinically so far as we know. That the three tests are all interrelated and depend on the three basic factors in electric excitation will become obvious on closer examination. Thus a change in the frequency of a sine wave stimulus involves (1) a change in the rate of rise of the individual pulse and (2) a change in the duration of each pulse.

There is no standard method for the expression and comparison of excitability. Perhaps the most familiar clinical test is that of Erb, which measures galvanic and faradic excitability. Others have employed chronaxie measurements. Recently Moor,³⁴ Marble³⁵ and Watkins³⁶ studied the entire strength-duration or voltage-capacity curves. Hill,²⁹⁻³⁷⁻³⁸ Monnier,³⁹ Blair²¹⁻⁴⁰ and Rashevsky⁴¹ have presented some theoretic treatments of electrical excitability which allow the latter to be expressed in fairly quantitative terms bearing some theoretic and perhaps practical significance. These theories are all basically similar and are founded on simple principles which make no attempt to explain the actual physical or biologic nature of the process, but

simply allow existing excitability data to be treated quantitatively. For our purpose, the treatment of A. V. Hill will be followed. Using his terminology, we propose to express electric excitability in terms of a single intensity factor (i. e., rheobase) and two time factors, "K," which is directly related to Lapicque's chronaxie, and λ , which is directly related to Keith Lucas' minimal current gradient and Fabre's "constante linear." These three values afford a fairly complete picture of the excitation process.

The object of electrical muscle stimulation should obviously be to produce a muscular contraction which simulates a normal voluntary contraction as closely as possible. It is well known to physiologists that a normal voluntary contraction is not a simple twitch but rather a smoothly graded tetanus. The mechanism by which such a contraction is produced has been extensively studied and is well understood at the present time. An understanding of this mechanism is essential for an understanding of electrical stimulation.

A skeletal muscle is composed of a number of individual motor units. Grading of voluntary muscular contraction is accomplished in two ways: (1) by an increasing number of motor units becoming active and (2) by an increasing frequency of response of individual units producing a more and more completely fused tetanus. The first is normally accomplished by an increase in the number of nerve fibers discharging; it can be accomplished artificially by an electrical stimulus of gradually increasing intensity. The second is normally accomplished by an increased frequency of discharge of individual neurons; it can be accomplished artificially by an increase in the frequency of electrical stimulation.

Hence, in designing an electrical current which will produce the most physiologic stimulus for skeletal muscle, two separate and distinct problems present themselves: (1) the optimum wave for the production of a single twitch and (2) the variation in intensity and frequency of these individual current pulses to produce a smoothly graded tetanus. Let us consider these two phases separately.

The wave form which will produce a contraction with the least intensity of current may be considered the optimum. For normal skeletal muscle, this problem has been extensively studied and quantitatively treated by Hill³⁷ and others. It is known that the greater the rate of increase in current intensity, the more effective the stimulus. Hence, the optimum wave form would be one with an instantaneous rise and a duration sufficient for stimulation. As the slope of current rise becomes less steep, more current is required, until eventually a slope is reached where stimulation is impossible regardless of how much the current intensity may be increased. This is the minimal current gradient of Keith Lucas⁴² and Fabre.²⁵

Similar detailed studies on denervated muscle appear to be lacking. It is known, however, that the threshold for slowly rising currents is lower in denervated than in normal muscle. This fact has been used as the basis for the so-called progressive currents which supposedly stimulate denervated muscle without affecting normal muscles in the vicinity. However, it is not clear from the literature whether the threshold for slowly rising currents actually becomes lower than that for currents of instantaneous rise.

The normal mechanism by which voluntary muscle contractions are graded in strength have been studied by a number of investigators.⁴³⁻⁴⁷ Briscoe,⁴⁸ in 1928, appears to have been the first to attempt to apply information of this type to electrical stimulation. In general, the smooth voluntary contractions involve a gradual increase in the number of individual units at work and a gradual increase in the frequency of individual unit responses. Of the

more recent studies on the frequency of discharge, Smith⁴⁵ reported a minimum of 5 to 7 per second during slight activity and 19 to 20 per second during a submaximal contraction. Lindsley⁴⁶ recorded frequencies varying from 3 to 50 per second.

Conclusions

1. *Theoretical Considerations.* — It would thus appear that the ideal stimulating current for normal muscle would consist of a series of pulses of instantaneous rise which gradually increase in intensity from threshold to maximal and in frequency from zero to 100 per second. For denervated muscle, the ideal current would be of similar form, but the individual pulses would have to be of longer duration and of lower frequency and perhaps of more gradual rise.

2. *Practical Considerations.* — It is not convenient and is probably not necessary to attain these ideal currents. A close approximation can be obtained with an apparatus which is capable of delivering sine waves of variable frequency from 0.1 to 500 cycles per second and in which provision is made for amplitude modulation (surging). It is unfortunate that the terms "galvanic" and "faradic" have become so deeply ingrained in the clinical and physiologic literature. Actually, from a physiologic viewpoint there is no sharp line of demarcation between them. A normal voluntary contraction is a tetanic contraction. Hence every current should be a tetanizing current. That tetanic contractions can be produced in denervated muscle by proper frequency adjustment has been reported by Fischer.⁴ Thus a normal muscle will respond with a smooth tetanic contraction to a 100 cycle wave surged at 20 to 30 per minute. A recently denervated muscle may give a similar response to a 20 cycle wave. From this viewpoint "galvanic" current simply represents a "faradic" current of very low frequency.

Summary

1. Evidence for and against electrical stimulation of the denervated muscle is present.
2. The disuse and exhaustion theories of atrophy are reviewed.
3. Some fundamental conceptions in electrical excitation of muscle are reviewed.

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(Continued on Page 748)

ARCHIVES of PHYSICAL THERAPY

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.. EDITORIALS ..



SEASON'S GREETINGS


Again the certain march of time has brought the altruistic spirit of the Christmas and New Year season. It is a time of good fellowship when our thoughts and actions should reveal a sincere interest in others and especially in those less fortunate than ourselves.

There is great need for the Christmas spirit in a world filled with sorrow and distress, hunger and pestilence, cruelty and death. Oppressed peoples of many nations, living in constant haunting fear, will find little joy at this Yuletide. Many have lost their homes, their families, in fact, all but life itself. Many are dying of starvation, exposure and disease. Let us hope and pray that another Christmas season will find them liberated from the aggressor's yoke.

Many homes in our own country are darkened by loneliness and sorrow. Some of our men and boys, who have gone forth to defend their country, will not return. Others are serving on far distant lands and seas where they are gloriously demonstrating that free men are determined to stay free. They will not be privileged to enjoy the Christmas cheer of the home circle.

Against such a background, none but the thoughtless can indulge in the gaiety which characterizes the holiday season in normal times. Money spent for useless gifts should rather be devoted to the alleviation of human misery or to the purchase of war stamps and bonds.

In an attitude of sober appreciation of the suffering, sacrifice and heroism of our fellowmen everywhere and of the great privilege which is ours to live under the folds of Old Glory, the officers of the American Congress of Physical Therapy and the editorial board of the ARCHIVES extend to our members, readers and advertisers the Season's Greetings.



ULTRAVIOLET DISINFECTION OF AIR

The bacteriocidal action of ultraviolet radiation is well established. On account of the poor penetrating power of these short wavelengths, however, bacteria contained in mucus and other secretions are protected from rapid destruction. Bacteria and viruses floating in the air are not so well protected by opaque surrounding media and are therefore vulnerable to ultraviolet radiation.

Wells¹ has done much fundamental investigation on air disinfection which he has reported in a number of interesting papers. Hart² has demonstrated the value of ultraviolet air disinfection during surgical procedures. Robertson and Doyle³ combined air filtration and ultraviolet disinfection and reduced air con-

tamination in the operating room to an extremely low level. Barenberg et al⁴ and Mundo and McKhan⁵ demonstrated a distinct reduction in the incidence of air borne infections in children's wards by the use of ultraviolet disinfection of air. Wells,⁶ on the other hand, according to a recent report, was unable to demonstrate a reduction in the incidence of colds by the ultraviolet technic.

In this issue of the ARCHIVES will be found an article by Coblentz on "Ultraviolet Radiation and Ozone as Aerial Disinfectants." It is apparent that the reduction of air contamination in operating rooms and children's wards by means of ultraviolet radiation is a subject of increasing importance. The use of this technic in industrial plants, school rooms and other public buildings is a distinct probability of the future. The present article should be read with interest.

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THE 1942 INDEX

There has been published in the ARCHIVES during the past year much valuable scientific material on all phases of physical medicine. According to the usual custom, an index has been prepared to render this material more readily accessible to the interested reader.

The index is divided as in past years into the "Subject Index" and the "Author Index." In the "Subject Index" are found references to published articles, abstracts, editorials, correspondence, and book reviews. In the "Author Index" is the alphabetical list of the authors whose articles have been published, of those who have discussed any of the published articles, and of the authors of the articles contained in the abstract section.

The original papers which have been published in the ARCHIVES during the past year have been of high scientific quality and have reflected certain definite advances in physical medicine. The editorial board has selected with considerable care all of the papers which have appeared. An effort has been made to publish only those which contain some distinct contribution to our knowledge in this field.

The attention of our readers is especially directed toward the important abstract section of the ARCHIVES. Many outstanding contributions to physical medicine appear in medical journals outside this immediate field. These have been carefully selected and condensed and appear in concise form in this section.

A great deal of time is required for the preparation of a good abstract and this time is consequently saved the reader. By using the bibliographic reference at the beginning of each abstract, he may obtain the finer details if he so desires. These abstracts all appear in the index which thus becomes the opening to a mine of interesting condensed information. It is an excellent idea to have each yearly volume of the ARCHIVES substantially bound for greater permanency and convenience.

PREACHING AND PRACTICING

In his little poem "Sermons We See," Edgar A. Guest expressed a great truth when he said,

"I'd rather see a sermon
Than hear one any day."

In the September-October issue of the *Physiotherapy Review* are shown two pages of prize winning photographs taken by F. R. Harding, B.P.A., at the Children's Hospital in Boston. The title of the exhibit, which was shown at the 1942 convention of the Association, was "Personal Body Mechanics in the Student Physical Therapy Program." The pictures, arranged in six pairs, show correct and incorrect postures which may be assumed by technicians in the performance of common procedures in the care of patients. They illustrate in a striking way the importance of correct body mechanics.

Certainly, there is no group of persons who should exemplify good posture more consistently than those who are trying to teach it to others. Posture consciousness can be much more successfully instilled into the patient when the technician herself has experienced it. It is the writer's belief that the student technician's progress in acquiring good body mechanics during her sojourn in the physical therapy school should be reflected in her final grading score.

Good body mechanics combined with optimum nutrition and good personal hygiene gives an air of efficiency and poise which add greatly to the effectiveness of the personality. Scientifically trained technicians with such personal attributes will be a distinct credit to the schools from which they graduate.

Suggested Uses of Refrigeration Anesthesia Including War Surgery — Allen and Crossman

(Continued from Page 718)

ture. Anything from 40 F. to 80 or 90 F. might be a hypothermia temperature.

I think the term "refrigeration" gives you the impression that it must be a temperature somewhat similar to the temperature of the refrigerator. That is the reason I feel that "refrigeration anesthesia" is a little better than hypothermia, although I will grant that it is hypothermia. The picture of one-half hour postoperative was a mistake. I was embarrassed the other day to get a journal from Mexico in Spanish, with pictures, and one was a picture of the man one-half hour postoperative, but it was dull compared with this of a fellow having a seven-course meal.

One thing they did do that was different from anything that we have done; they showed a picture of the man in the patio, dressed in all kinds of flowing white things, so that he looked like one of the Untouchables of India, sitting beside a big stone fountain, resting on the fountain, with his leg stuck into a long metal pail, being refrigerated. That was the pre-operative technic. It was one of the most picturesque things we have seen.

The high insulin requirement of toxic diabetic patients falls promptly. We use less insulin immediately the patient becomes anesthetized and from there on he is easily controlled.

MEDICAL NEWS

Our Editor in Australia

Again we are happy to announce that we have heard from Dr. Walter M. Solomon, this time to send us the Season's Greetings. His editorial staff and his many friends join to extend their best wishes to him for his health and happiness for the coming year.

Dr. William T. Anderson Called to Navy

Dr. William T. Anderson, Jr., for nearly twenty years director of the radiation research laboratory of the Hanovia Chemical and Manufacturing Company, Newark, N. J., has been granted a leave of absence to accept a commission as a Lieutenant in the Naval Reserve, Dr. Charles Engelhard, President, announced today.

According to Dr. Engelhard, of particular importance and interest this wartime winter are the researches Lt. Anderson has conducted with Prof. W. F. Wells, of the University of Pennsylvania, on the value of air sterilization by ultraviolet lamps for curbing such air-borne infections as influenza and scarlet fever in military barracks and in schools.

Lt. Anderson has reported to the Naval Training School at Dartmouth College.

Lt. Anderson's services were requested by the Navy through Princeton University from which he was graduated with high honors in chemistry in 1921. He received his Ph.D. degree from the same university two years later.

In May, 1923, Lt. Anderson was appointed a National Research Fellow in Physical Chemistry at Yale University, but declined the appointment to accept the position with the Hanovia Chemical & Mfg. Co.

Lt. Anderson has long been recognized in scientific and medical circles as an authority on radiations, especially ultraviolet. He is a member of the Chemical Society of America, the American Congress of Physical Therapy, and the Optical Society of America. In cooperation with the late Dr. Alfred Hess and Dr. Harry Steenbock, of the University of Wisconsin, he conducted experiments on the employment of ultraviolet radiations in the treatment of rickets. With Dr. Richard Kovács, of City Island Hospital, and Dr. David I. Macht, of the Johns Hopkins Medical School, he conducted successful research on the effect of ultraviolet on anemia and pernicious anemia.

Army Central Hospital of Mexico Opened

Announcement has been received from the office of the Secretary for National Defense, Military Health Department, Mexico, D. F., of the opening November 20, 1942, of the Hospital Central Militar. The program of the opening ceremonies was as follows:

I. Honors to the President of the Republic. II. Music by the Military Band directed by Mayor Genaro Nuñez. III. Report by the Army Surgeon General Ignacio Sánchez Neira, Director of the Military Health Department. IV. Music by the Army Band. V. Speech by Commander D. E. M. Tomás Sánchez Hernández, Commander in Chief of the Army Division of the National Defense. VI. The President of the Republic, Field Marshall, Mr. Manuel Avila Camacho declared officially open, the Hospital Central Militar.

American College of Physicians Cancels 1943 National Meeting

The Board of Regents of the American College of Physicians has announced the cancellation of their 1943 Annual Session, which was scheduled to be held in Philadelphia, April 13-16, 1943. This action was taken after thoughtful consideration of all factors involved, including an intimation from the Secretary of War and the Office of Transportation that larger national medical groups should not plan meetings at the time set; a growing difficulty in getting speakers and clinicians of top rank to maintain the usual standards of the program; prospect of greatly reduced attendance, because civilian doctors are faced with too great a burden of teaching and practice already; a decreasing active membership, due to approximately 25 per cent of all doctors being called to active military service. President James E. Paulin announced, however, that all other activities of the college would be pursued with even greater zeal, and that the college would especially promote regional meetings over the country and organize post-graduate seminars in the various military hospitals for doctors in the armed forces.

Rehabilitation Council Formed

At a meeting of the American Physiotherapy Association in New York in August a permanent council was formed to serve as an "observation post" for member agencies and as a channel for communication with federal and state agencies and with each other. The objective is to aid in the rehabilitation of members of the armed forces and of civilians. Dr. Philip D. Wilson, New York, was elected chairman and Col. John N. Smith, Jr., New York, Director of the Institute for the Crippled and Disabled, Vice-Chairman. Member-

ship in the council is available to national associations interested in rehabilitation on election by the executive committee, which is composed of Harry H. Howett, National Society for Crippled Children; Holland Hudson, New York, Director of Rehabilitation, National Tuberculosis Association; Evelyn C. McKay, New York, American Foundation for the Blind; Major Julia C. Stimson, Army Nurse Corps, U. S. Army, New York, American Nurses Association, and Dr. George H. Stevenson, New York, American Psychiatric Association.

Supreme Court Asked to Declare Unconstitutional Contraceptive Legislation

About seven hundred physicians throughout the United States filed briefs in support of a petition asking the U. S. Supreme Court to review a decision by the Connecticut Supreme Court of Appeals holding legislation which prohibits physicians from prescribing contraceptive devices for married women when necessary to preserve life or health as constitutional. The physicians' briefs supported a petition of Dr. Wilder Tileston, David P. Smith clinical professor of medicine at Yale University School of Medicine, New Haven, and a practicing physician. According to the *Washington Star*, October 25, Dr. Tileston started the litigation by requesting an opinion as to whether the statute would prohibit him from prescribing contraceptives to three specified patients. A brief filed by one hundred and sixty-six physicians in thirty-six states and the District of Columbia contended that "medical opinion with substantial unanimity supports the prescription and use of contraceptives in cases" like those involved, the *Star* stated. Another brief presented by five hundred and forty-one Connecticut physicians asserted that Dr. Tileston was "faced with the alternative of failing in his duty as a physician or subjecting himself to a criminal penalty in the event that this statute is found to be constitutional."

Changes in Rules of Committee on American Health Resorts

The Committee on American Health Resorts has made the following changes in its rules, which are herewith published by authority of the committee.

W. W. BAUER, M.D.

Changes in the Rules

Former rule 6 was renumbered to become new rule 9.

The following paragraph appearing in the introduction to the first edition of the rules was transposed to become:

RULE 6. — Modifications of the Rules. — When any modifications of the rules are deemed neces-

sary, those resorts already listed under rules as previously adopted will be notified promptly and will be given reasonable opportunity to comply with the modified ruling or voluntarily to withdraw from the listing.

The following new rules were adopted:

RULE 7. — Advertising of Health Resorts. — A health resort when listed will be permitted to make use in its advertising and descriptive literature of the phrase "listed by Committee on American Health Resorts of the American Medical Association." No other phraseology shall be used, nor shall the name of the American Medical Association appear in any advertising or publicity matter except as included in this phrase. The fact that a resort is listed shall not constitute the principal feature of publicity, nor shall the fact of such listing be exploited.

RULE 8. — Duration of Listing. — Listing of an institution shall on its first application be for a preliminary period of one year; subsequent listings shall be for a period of three years; all listings shall be subject to prior review in the event of violations of these rules. — [Reprinted with permission, J. A. M. A. 120:773 (Nov. 7) 1942.]

New Foundation for Research in Hearing

The Parmly Foundation has been established at the Illinois Institute of Technology to carry on research in hearing. The foundation, which was created through a trust fund of \$300,000 set aside by the late Samuel P. Parmly, Jr., a Chicago business man, will concentrate its work on the physics of hearing and plans to cooperate with the medical profession on other aspects of the problem. This is in accordance with the plan of Mr. Parmly, who also stipulated that the research must be done at an institution of learning.

Dr. Pettitt Made Chief of Emergency Medical Services, Illinois State Council of Defense

Announcement has been received that Governor Green has appointed Dr. H. L. Pettitt of Chicago as Chief of Emergency Medical Services for the State of Illinois.

New Editor Named for Rocky Mountain Medical Journal

Dr. Lyman W. Mason, Denver, assistant professor of obstetrics and gynecology, University of Colorado School of Medicine, has recently been made acting scientific editor of the *Rocky Mountain Medical Journal*. Dr. Douglas W. Macomber, Denver, was granted a leave of absence from the position to become a major in the medical corps of the Army of the United States.

How to Conserve Medical and Surgical Rubber Goods

Of all the materials which must be conserved to the utmost, rubber is probably most important. By far the biggest "source" of rubber will be the saving of citizens of this country which can be accomplished by taking proper care of the rubber goods they now have. It is possible to extend the life of rubber goods as much as 50 per cent by observing a few simple principles.

Some General Principles. — The greatest enemies to the long life of rubber are sunlight, heat, oils, greases and solvents. To preserve rubber goods the following general rules should be observed:

1. Clean and dry rubber goods thoroughly before storage.

2. Store in a cool, dark and dry room, away from sources of heat. (New goods should be kept in their boxes.)

3. Lay rubber articles flat when storing, allowing them to assume their natural position. Rubber under a permanent strain loses its life and will set up a deformation which may cause it to crack.

4. Wash with soap and water or alcohol as soon as possible after contact with oils, greases and solvents.

5. Handle rubber goods carefully and avoid puncturing with sharp instruments or the finger nails.

Molded Rubber Goods. — The water used in a water bottle should in no case have a temperature higher than 140 F. Boiling water ages the rubber prematurely. A water bottle should be filled to two-thirds capacity with hot water. The bottle should then be squeezed to expel the air in the bottle and the stopper inserted. There should be no air in the bottle when in use. Punctures to water bottles would be greatly reduced if the bottles instead of being pinned in cloth before being applied to the patient's body were placed in a bag fitted with drawstrings. Ice for throat collars and ice caps should be chopped into fine pieces before and not after it is placed in the bag. The metal shutoff device on the tube of a syringe or enema bag should not be left clamped down. This will weaken the tubing at this point and frequently cause the two inside surfaces to stick together. The shutoff valve should be moved to different points on the tubing to prevent creating a permanent dent at any one point. After use, these items should be thoroughly drained and dried. If an antiseptic or other solution has been used, they should first be rinsed out with clean warm water. Before storing, they should be inflated so that the sides will not stick together.

Rubber Sheeting. — Rubber sheeting should be washed with soap and warm water, thoroughly rinsed and then cleaned with a 5 per cent solution of cresol. When it is not being used, cover evenly with talc and roll on a tube. Do not fold, as this material has a tendency to deteriorate at the line of folding.

Rubber Flooring. — Unpolished rubber floors or tile should be cleaned by brushing with a push broom and washing small sections of the floor at a time with a mild solution of washing soda or trisodium phosphate. The solution is made by dissolving about $\frac{1}{4}$ cup of the cleanser in 12 to 16

quarts of clear cold water. All traces of the cleaning solution should be removed by mopping the floor thoroughly with clear water. This process should be continued over the entire floor. A buffer should not be used for scrubbing. Brushing the floor often makes frequent cleaning unnecessary. When the floor has been dried and buffed, it may be waxed by applying a good quality water emulsion wax. Waxes used on rubber floors should be free of oil, fats and organic solvents.

Rubber Tires and Wheels. — Avoid as far as possible running rubber tired equipment over greasy or oily floors. Some reclaimed rubber will be allowed for the replacement of rubber tires on certain types of essential hospital equipment. Any such allotment will, however, be made only for equipment used near patients' rooms or operating areas.

A Noninjurious Substitute for Glycerin Lubricating Jelly. — The shortage of glycerin and gums has made it increasingly difficult for doctors in hospitals to obtain adequate supplies of these materials for lubricating gloves, catheters and other surgical rubber products. Realizing this situation, the Canadian Hospital Council requested the Ontario College of Pharmacy to investigate and develop if possible a product which would not require either glycerin or gum and would be satisfactory to the profession. Such a product was developed by Mr. D. E. MacKenzie, assistant professor of pharmacy in the Ontario College of Pharmacy. The method of preparing material was described in the July, 1942, issue of the *Canadian Medical Association Journal*. The following is quoted from that article:

It was found that the following formula would meet these requirements:

Starch	7 ounces 135 grains
Distilled water	1 gallon
Sodium lactate (60 per cent)	90 fluidounces
Mercuric oxycyanide	280 grains

Dissolve the mercuric oxycyanide (B. P.) (sol. 18 W) in part of the distilled water, using the remainder of the water to form a smooth paste with the starch. Combine these two portions with the sodium lactate and heat in a steam kettle or some other device capable of supplying a temperature of approximately 100 C. The heating, with moderate agitation, is continued until a translucent jelly is formed, at which point the product can be at once transferred to suitable containers.

Sterilization. — The product is best sterilized after it has been placed in containers and, following latest approved procedure, can be successfully rendered sterile by autoclaving at a steam pressure of 10 pounds (115 C., or 240 F.) for a period of thirty minutes. — [Reprinted with permission, J. A. M. A. 120:847 (Nov. 14) 1942.]

Dangerous to Health — When Used as Directed

[EDITORIAL NOTE. — These abstracts differ from other abstracts of Notices of Judgment issued by the Food and Drug Administration of the Federal Security Agency which have appeared in these pages in that they include reference to the fact that these nostrums were specifically declared to be dangerous

to health when used in accordance with the directions given on the label by the manufacturer. The abstracts that follow are given in the briefest possible form: (1) the name of the product, (2) the name of the manufacturer, shipper or consigner, (3) the date of shipment, (4) the composition, (5) the type of nostrum, (6) the reason for the charge of misbranding and (7) the date of issuance of the Notice of Judgment—which is considerably later than the date of the seizure of the product and somewhat later than the conclusion of the case by the Food and Drug Administration.]

Radioactive Cones. — Thomas Radioactive Cone Company, Inglewood, Calif. Shipped March 20, 1940. Misbranded because of misleading labeling which failed to reveal that when used to impart radioactivity to water, the drinking of such water might result in injury to the user; further misbranded because label failed to bear name and place of business of manufacturer, packer or distributor or to give the common name of ingredient or ingredients, adequate directions for use or sufficient warnings against use by children and regarding unsafe dosage, as the product was found to be dangerous to health when used with the frequency or duration prescribed, recommended or suggested on the label.—(*D. D. N. J., F. D. C. 331; March, 1942.*)

Young's (Dr.) Rectal Dilators. — F. E. Young & Company, Chicago. Shipped between May 10 and June 10, 1940. Consisted of 4 hard plastic cylinders flanged at one end, slightly enlarged and pointed at the other, and varying in diameter from $\frac{1}{2}$ inch to 1 inch and varying in length from 3 to 4 inches. Misbranded because represented on label to be a simple, harmless, convenient, nonhabit-forming, ideal treatment to overcome constipation and hemorrhoids permanently by inducing natural and regular bowel movement, and to improve and strengthen the body, restore the sphincter muscles to normal condition, relieve blood congestion, establish a healthy, vigorous circulation and do many other things. Further misbranded because dangerous to health when used with the frequency and duration suggested on the label. — (*D. D. N. J., F. D. C. 335; 1942.*) — [Reprinted with permission, J. A. M. A. 120:551 (Oct. 17), and pg. 641 (Oct. 24) 1942.]

Training Center for Kenny Treatment

Dr. Don W. Gudakunst, medical director of the National Foundation for Infantile Paralysis, announces that a training center will be established in New York in December where doctors, nurses, and physiotherapists can learn the Kenny treatment for infantile paralysis. The center will be conducted under the auspices of the Greater New York Chapter of the Foundation. The staff will include Dr. Kristian G. Hansson, Dr. Richard Kovács, Dr. William Benham Snow, and Dr. William Bierman.

Dr. Elmer Frederick Scheve 1881-1942

It is with sincere regret that we announce the death of Dr. Elmer Frederick Scheve of Mascoutah, Illinois. Dr. Scheve was born in 1881 and graduated from the Washington University School of Medicine, St. Louis, Missouri in 1903; was licensed to practice in Missouri the same year. Dr. Scheve was a Fellow of the American Medical Association and a member of the American Congress of Physical Therapy for a number of years. We extend our sympathy to his family and to his many friends.

Dr. Leon Earl King 1908-1942

It is with regret that we announce the death of Dr. Leon Earl King of Hot Springs National Park, Arkansas. Dr. King was born in 1908 and was graduated from the University of Arkansas School of Medicine, Little Rock, Arkansas in 1931, was licensed to practice in Arkansas the same year, specializing in internal medicine. Dr. King was a Fellow of the American Medical Association and a member of the American Congress of Physical Therapy. We extend our sympathy to his relatives and friends.



BOOK REVIEWS

THE AUTONOMIC NERVOUS SYSTEM. ANATOMY, PHYSIOLOGY, AND SURGICAL APPLICATION. By *James C. White, M.D.*, Assistant Professor and Tutor in Surgery, Harvard Medical School; Chief, Neurological Service, Massachusetts General Hospital, Boston; and *Reginald H. Smithwick, M.D.*, Instructor in Surgery, Harvard Medical School, Assistant Visiting Surgeon, Massachusetts General Hospital. Foreword by Professor *Walter B. Cannon, M.D.* Second Edition. Cloth. Pp. 469 with 92 illustrations. Price, \$6.75. New York: The Macmillan Company, 1941.

Special discussions of the problems of the autonomic nervous system have heretofore been addressed to an understanding few, and so far as this was related to the general practitioner, their interest was in a general sense as limited and vague as that provided by the average curriculum. It is therefore gratifying to call attention to a work that spared no effort to present this subject in a manner especially informative and authoritative for the benefit of all concerned. The opinions voiced below may therefore in a small measure be taken to constitute both an endorsement and a sincere recommendation to the progressive element in the profession concerning the scholarly and informative nature of this monograph. It follows that any effort invested in the study of this volume is bound to broaden the medical orientation of the physician and greatly profit him in the care of the many intractable symptoms discussed within these pages. Certainly this is no average book on an ordinary problem addressed to a routine or curious reader, for it requires mental concentration or special interest plus above average undergraduate training to appreciate the high content of information provided by the authors. The fact that it has gathered little dust on the bookseller's shelf despite its title is perhaps as significant a refutation that abstruse discussions of the structure and function of the autonomic nervous system are synonymous with uninspired reading. Its increasing popularity is best proved by the answer of a second edition to the continued demands by students and physicians interested in clinical neurologic disorders and neurophysiologic problems wherein dysfunction and intractable pain constitute an important syndrome. As compared to the first printing, one observes that much of the text has been revised and brought down to date, and a great effort made in classifying, summarizing and correlating the quantitative information for practical purposes. Much of this labor may be attributed to the new collaborator, Dr. Reginald Smithwick, who in addition contributed largely concerning the latest knowledge of the special structure and function and the surgical procedures used to re-

lieve the many distressing symptoms associated with the dysfunction of the autonomic nervous system. To what extent this has been carried out is seen in that over half of the book has been rewritten, its length increased by one-third, and augmented by thirty new illustrations. Finally, new chapters have been incorporated dealing with such practical problems as the management of Raynaud's disease, the surgical treatment of hypertension and the presentation of a great mass of new data. The last thing written is usually the foreword, and this by Professor Walter B. Cannon is a classic example of that terse and lucid quality possessed only by exceptional teachers which goes far to stimulate and inspire others to emulate.

CLIMATE MAKES THE MAN. By *Clarence A. Mills, M.D., Ph.D.*, Professor of Experimental Medicine, University of Cincinnati. Cloth. Pp. 320. Price, \$3.00. New York: Harper & Brothers, 1942.

The awareness of a connection between the solar system and human welfare is far older than recorded history. There has accumulated a considerable mass of evidence regarding the surprising and powerful effects exerted on humans by two outside factors: Climate, the long-term average of atmospheric conditions, and weather, the short-cycle changes which make one day or hour different from the next. Climate affects man's rate of growth, speed of development, resistance to infection, fertility of body and mind and the amount of energy available for thought or action. Climate affects man's sickness as well as his health. In his vegetative tropical existence he is much more susceptible to infectious diseases, while in temperate coolness the stress of a more energetic life causes frequent breakdown in his body machinery and raises heart failure to a leading position among the causes of death. Weather changes also affect man but somewhat differently from climate. In the earth's most active storm belts violent and frequent storms become an important factor of existence, adding spice to life, but at the same time interfering with body functions and bringing on many serious ailments. Such influences have been studied less than those of climate. The picture of these forces acting on man is a fascinating one as painted by Mills. The picture is still blurred in places but its main outlines are clear-cut and definite. The author shows that man is not the independent master of his own life as he fondly believed a few decades ago but instead is pushed hither and yon by larger outside forces. Mills shows that man could learn a great deal from primitive sunworshippers, for he is still a veritable pawn of the universe.

"Climate Makes the Man," is the answer to all the conjectures and theories on just what climate does to us. It can be recommended not only as a scientific contribution but also as fascinating reading.

TEXTBOOK OF HEALTHFUL LIVING. By *Harold S. Diehl*, M.A., M.D., Sc.D., Professor of Preventive Medicine and Public Health, and Dean of the Medical Sciences, University of Minnesota; Director, Health Studies, American Youth Commission; Member, Health Council, Boys' Clubs of America; Former President, American Student Health Association. Second Edition. Cloth. Pp. 634. Price, \$2.75. New York and London: McGraw-Hill Co., 1939.

It is true that the health of most of us could be materially improved and our pleasure of living increased if we would only live a little more intelligently. The author shows that the maintenance of health is much less difficult and mysterious than we have believed. During the Middle Ages in Europe the average length of life was less than 20 years. Last year in India it is reported to have been only 26.6 years but in the United States the life expectancy at birth had extended to sixty-two years for males and females combined. Splendid as this is, it is still four years short of the present life expectancy in New Zealand. "Is long life desirable?" is a frequent question. It is reported that most scientists and scholars do their best intellectual work at about fifty years of age, but the curve of individual accomplishment has dropped little at the age of sixty from its greatest peak of ten years before. We therefore should look today for the opportunities for the prolongation of life. This is the second edition of this book. The first edition appeared as one of the Whittlesey House of Health Series. This edition was written as a textbook of hygiene for colleges and universities. New chapters on modern parenthood, community health and organized health work have been added and various sections of the book have been rewritten. The discussion on anatomy and physiology has been omitted, as the author believes that the subjects usually included in hygiene textbooks is only remotely related to the practice of personal hygiene and that an increasing number of students are receiving instruction in these subjects and so tend to lose interest if they meet the same subject matter in college hygiene courses. This book can be recommended as an excellent textbook in personal hygiene for use in colleges and universities.

CABOT AND ADAMS PHYSICAL DIAGNOSIS. Thirteenth Edition. By *F. Dennette Adams*, M.D. Instructor in Medicine, Harvard Medical School, Courses for Graduates. Cloth. Pp. 833, illustrated. Price, \$5.00. Baltimore: The Williams & Wilkins Company, 1942.

This book, now in its thirteenth edition, is so well known, that one hardly needs to review its contents. Until 1937, the book was written and revised, primarily by Dr. Richard Cabot, long known for his advancement in the teaching of medicine. The twelfth and thirteenth editions were more extensive

than the previous editions. Whereas the first eleven editions included only the technics which Dr. Cabot thought valuable and only those aspects of disease with which he had had personal experience, Dr. Adams has gone much further and has rightly concluded that "no one person's experience is sufficient to include all that the student of physical diagnosis should know." The author has made use of the wide knowledge and experience of many members of the staff of the Massachusetts General Hospital. Through this assistance he has revised several of the sections of the book, such as the sections on heart murmurs, inadequate cardiac output, cardiovascular diseases, diseases of the mouth, peripheral vascular disease, and gynecology, urology and neurology. The outline of the book has apparently remained basically the same. This edition, like the previous editions, is excellently illustrated, clearly and concisely written, and contains the outline of a vast amount of medical knowledge in regard to physical diagnosis. It can be highly recommended to the student and the medical practitioner.

EFFECTIVE LIVING. By *C. E. Turner*, A.M., Sc.D., Dr. P. H., Professor of Biology and Public Health, Massachusetts Institute of Technology; Formerly Associate Professor of Hygiene, Tufts Medical and Dental Schools; Chairman, Health Section, World Federation of Education Associations; and *Elizabeth McHose*, B.S., M.A., Director of Physical Education for Girls and Chairman of the Health Council, Senior High School, Reading, Pennsylvania. Cloth. Pp. 423, with 164 illustrations. Price, \$1.90. St. Louis, Mo.: C. V. Mosby Co., 1941.

This treatise was written for the youth of America. It is an unusually interesting presentation of factual material relative to physical and mental health. Both are necessary for maximum development of the individual. Knowledge is essential if the young men and women of today are to achieve successful adjustment in a complex society. In this book the authors have sought to explain the relation between healthful living and a vivacious personality. The importance of sanitation, safety first measures, adequate diet, daily exercise, correct posture, sufficient rest and wholesome emotions is discussed. The value of these is increased by a comprehensive unit devoted to the physiologic functions of the body.

The material has been selected as that most needed in the building of a happy, healthful life. The authors are well qualified to make this selection as they have been in personal contact with the youth as teachers. The ordinary concept of health is narrow. It is defined in a broader sense by the authors, "Health implies the normal functioning of every part of the body. It increases one's joyousness, cheerfulness, and accomplishment. It includes a sound, efficient mind, and wholesome emotions. It means courage and enthusiasm for life. It involves complete physical and mental fitness."

This book is much needed just at present and should be read by the youth of our country. It will also be of interest and value to all who desire to experience life as enthusiastic living.

ESSENTIALS OF NURSING. By *Helen Young*, Director of Nursing and Associates of the Presbyterian Hospital of the City of New York. *Eleanor Lee*, Editor. Cloth. Pp. 594, illustrated. Price, \$3.00. New York: G. P. Putnam's Sons, 1942.

This is a new textbook on nursing procedures. It covers the field of nursing from that of day to day bedside technics to the most complicated specialized fields of nursing. The basic principles of the many types of nursing are carefully discussed and this is followed by a comprehensive discussion of the care and treatment in specific problems encountered in a wide variety of conditions. Special therapeutic procedures are carefully described: For example, the use of hot and cold therapeutic baths; other nursing procedures such as steam inhalations, rectal treatments, vaginal douche or irrigation, perineal care, catheterization and the like; also the special nursing technics in regard to conditions of the ear, nose and throat. There is a careful discussion on the administration of medicine, fluids and oxygen. There is a discussion, too, of the nursing care necessary in preoperative and postoperative nursing as well as surgical dressings. The chapter on the required equipment necessary for administering prompt treatment in emergencies and that dealing with responsibility of the nurse in emergencies are especially good. There are discussions of the more highly technical subjects such as diagnostic roentgenologic examinations, procedures used for diagnostic or therapeutic purposes such as endoscopy, laryngoscopy, bronchoscopy and the like; and special therapies such as radiotherapy, hyperthermia by physical means and orthopedic surgery. All these subjects would appear to need more discussion than is given to them in this book in order to be adequate for any kind of specialization, but such specialization would not be expected in the basic teaching of the essentials of nursing. Therefore, it is presumed that these chapters are added only to give a student nurse some insight into what special fields consist of. There are certain subjects discussed in the book which would appear to be out of the field of nursing, but this is no criticism of the book since it allows for broader general knowledge to the nurse.

As pointed out in the foreword of the book, all the technics and procedures described are those used at Presbyterian Hospital in New York City. Therefore, there may be some variance of opinion and disagreement among the various institutions in regard to some of the procedures described. This is especially true in regard to some of the specialized fields, since in the discussions of some of these only one or two methods as used at Presbyterian Hospital are presented, whereas there may be several equally efficient methods of accomplishing the purpose in general use elsewhere. An example of this is the discussion of hyperthermia, in which only the two types of cabinets which are used in this particular institution are described, whereas there are several types of fever cabinets which are being used elsewhere even more widely than those mentioned.

The book is well written and illustrated. The field of nursing with its specialties is clearly and ade-

quately discussed. The book can be highly recommended as a textbook for teaching nursing technic or as an excellent reference book in any school of nursing.

THE MANAGEMENT OF FRACTURES, DISLOCATIONS AND SPRAINS. By *John Albert Key*, B.S., M.D., St. Louis, Mo. Clinical Professor of Orthopedic Surgery, Washington University School of Medicine, etc., and *H. Earle Conwell*, M.D., Birmingham, Alabama; Orthopedic Surgeon to the Tennessee Coal, Iron and Railroad Company, etc. Cloth. Third Edition. Pp. 1301 with 1259 illustrations. Price, \$12.50. St. Louis: The C. V. Mosby Company, 1942.

Infrequently the publication of a book brings to public attention an especial event—either the contents rise above the mediocrity of the mechanics of printers' ink or it conveys a message of a three dimensional character. The authors of this third edition have distinguished themselves by contributing an outstanding exposition that veritably exhausts the separate and correlated problems found in the management of fractures, dislocations and sprains. Indeed, while it cannot be said that they have overwritten themselves in their attempts to detail the myriad interlocking methods of treating the simple and complicated varieties of pathologic conditions arising from trauma, they have nevertheless managed to create a tome so bulky as to suggest that girth control would here be considered a practical desideratum. Perhaps the fault lies in the fact that certain of the collaborators viewed their separate efforts as of monographic importance, and while it is admitted that much that each has said deserves all the credit which has rendered this work invaluable to an increasing number of physicians, one may well speculate how far heft can be abused before it will discourage a reader especially in the face of similar and contending contributors. It would appear logical that the object of future editions should be to revise the contents in the downward direction, and to stress essentials rather than academic detail, or else divide the work into two volumes.

The authors have long been known as keen protagonists of the modern surgical school and thus have incorporated in this edition many of the new or latest methods found beneficial or so tested as to warrant inclusion in a textbook. The most extensive revision has been devoted to the treatment of fractures of the hip and spine, and like efforts have been introduced in other chapters both in the nature of additions or substitutions. In contrast to the positive assets of the work in general as hinted above, one cannot help voicing one's disappointment at the amateurish discussion of the place of physical therapy in the scheme of surgical therapy so detailedly present in this work. The best example of the sheer unbalance between what the authors have preached for both surgical and physical methods in fractures, dislocations and sprains is to point out that in a book of more than 1,300 pages only four and one-half are devoted to physical therapy in relation to the above mentioned traumas.

A MANUAL OF BANDAGING, STRAPPING AND SPLINTING. By *Augustus Thorndike, Jr.*, Associate in Surgery, Harvard Medical School; Surgeon to the Department of Hygiene, Harvard University. 12 mo, 144 pages, illustrated with 117 engravings. Paper, \$1.50. Philadelphia: Lea & Febiger, 1941.

The book presents in elementary fashion the common types of bandages, strappings and splints and follows in general the bandaging course given in the Harvard Medical School. The technic of the use of dressings, bandaging, adhesive plaster and splints is fully presented. The manual emphasizes the principles of support, elevation, immobilization and gentle compression. It should be equally valuable to the young surgeon, the medical student, nurse, interne and to those groups of laymen who are now preparing to assist the medical profession in the event that their services are needed. It is written in simple language and is amply illustrated with excellent line drawings which enable the beginner to visualize each step that he must take. This volume is in many ways a companion piece to the well known treatise of the author on athletic injuries.

PATHOLOGY OF TRAUMA. By *Alan Richards Moritz, M.D.* Professor of Legal Medicine, Harvard Medical School. Cloth. Pp. 386, illustrated. Price, \$6.00. Philadelphia: Lea & Febiger, 1942.

The author of this book points out that the amount of literature on the clinical observations of mechanical injuries is disproportionate to that on pathologic anatomy, histology and the pathogenesis of the complications and the sequelae of such lesions. He mentioned that "although many aspects of trauma are dealt with in the various textbooks and monographs, there exists no comprehensive treatise devoted primarily to the pathological aspects of lesions produced by mechanical violence." In this book, an attempt has been made to survey the principal causes of mechanical injuries, pathologic lesions and complications of sequelae, and collateral evidence which may be important from a medicolegal aspect. The author has briefly discussed those general conditions which are adequately covered in other books. Subjects which he has felt were inadequately discussed elsewhere he has discussed in considerable detail.

In the chapter on Mechanical Injuries, under general considerations, he has pointed out the mode of injury by means of mechanical agents in relation to force. He discusses the reactions to injury in quite a different manner from that of the usual textbook on pathology in that he points out the more specific pathologic findings and their importance in relation to legal medicine. In the discussion on types of wounds produced by mechanical injury, the medicolegal aspect again is stressed in that he describes the type of injuries resulting from many different agents which may be the result of violent action. Along with this, there is a rather long and interesting discussion of bullet wounds and the injuries caused by these. Injuries resulting from high explosives also are considered. There is a chapter dealing with delayed infections from traumatized

tissues. There is a discussion of trauma in relation to the etiology of tumors. There are chapters on mechanical injuries of the cardiovascular and respiratory systems, the alimentary canal, male and female urogenital tract, the brain and meninges and bones. The book is most interestingly written and well illustrated. At the end of each chapter there is a long bibliography. It would seem that this book should be of considerable interest and of importance at the present time because of the large number of injuries occurring throughout the world in relation to the war, not only on the battlefields but also in factories, civilian bombing and the like. This book can be recommended most highly not only to the general practitioner and the medicolegal expert, but also to the surgeon and pathologist.

SCIENCE IN PROGRESS. By *Harlow Shapley; Edwin Hubble; Hans Bethe; V. B. Zworykin; P. W. Bridgman; Lionel S. Marks; James Franck; John G. Kirkwood; Perrin H. Long, and Hermann Mark.* Edited by *George A. Baisell.* Third Series. Cloth. Pp. 332 with 35 illustrations. Price, \$3.00. New Haven: Yale University Press, 1942.

Undoubtedly the thought has frequently come to many sensitive readers that books often convey an elusive suggestion of personality, due to the spiritual and corporate quality of the work as a whole. It is not an uncommon experience of the bibliophile to have his eyes arrested before the outward form of a tattered or ancient, or even a new volume and gaze on its closed pages with an inward caress. Such is the feeling invoked by this book, a feeling as if it is covered by the odor of scholastic sanctity, because it is not only a contribution incorporating the 1941 and 1942 lectures of the National Sigma Xi Lectureships but it is sponsored and published by the Yale University Press. If what has been said is taken as abstract in view and impressionistic, a concise evaluation of the material embodied in this text may provide the final proof of the virility and independence of contemporary scientific thought. It is a challenge to all past and present advocates for the suspension of investigation and the creation of a moratorium on science. Everyone of the ten lectures by distinguished authorities rises high above its informative content and gives proof that our sense of devotion to truth will create that ultimate faith in the beneficence of science and of scientists in that peaceful world to come. The problems discussed may at times be a far cry from objective reality, and yet one has but to read with required concentration such far flung topics as the meaning and proximity of the galaxies, or attempt to understand the problems of the expanding universe in relation to our small global holocaust to appreciate that despite our momentary world headache, the stars and the galaxies and the universe are alive with deep meaning for future generations. Certainly to the physician interested in the biophysical structure and action of the microsm within our macrocosm nothing will be found in contemporary literature more timely or authoritative than the chapters dealing with the "image formation by electrons"; "some fundamental aspects of photosynthesis"; "the structure of liquids"; "the mode of action of sulfanila-

made," or the scientific aspect of the creation of synthetic rubber. The Yale University is to be warmly commended for the publication of such an unusual series on timely scientific subjects, the Sigma Xi is to be felicitated on the authoritative quality of their essayists, and the scientific world can do no less than encourage the continuance of this splendid project.

CIVILIAN HEALTH IN WARTIME. By Francis R. Dieuaide, M.D., Associate Professor of Medicine, Harvard Medical School, Massachusetts General Hospital. Cloth. Pp. 328. Price, \$2.50. Cambridge, Massachusetts: Harvard University Press, 1942.

It is certain that physical and mental health are essential to winning World War II. They should be improved rather than maintained. This book provides the general reader with statements in broad but definite outline of the varied aspects of health in the United States in relation to the war. It constantly stresses positive health. Hence diseases are not described; nor are methods of treatment presented. The various subjects presented are shown in the following chapter headings: health and the impact of war on it; the nutritional background; increased strength through better diets; safety from infectious diseases; shelter and ariment; mother and child; the ageing and the aged; occupation and recreation; about our doctors and nurses; mental calm and vigor; and the morale and second world war.

In this book there is developed the subject of the health of a people at war. American health in recent years is discussed, showing how much thought is given to physical health but not enough to mental health. Great attention is given to the care of children, but little to the elderly. It shows that occupational hygiene has not gained its rightful place among us. As a people we are only dimly aware of the tremendous differences of health between the social groups and geographic regions of America. Of course the aims of our enemies are to destroy our health. The epilogue explains that morale is mental health in respect to stress and strains in a given period and set of circumstances and is therefore related to health as a whole. It is recommended to intelligent citizens interested in their own and the nation's physical and mental health.

PHYSICAL CHEMISTRY FOR STUDENTS OF BIOCHEMISTRY AND MEDICINE. By Edward Staunton West, Ph.D., Professor of Biochemistry in the University of Oregon Medical School. Cloth. Pp. 368 with figures and charts. Price, \$5.75. New York: The Macmillan Company, 1942.

Few subjects in the related field of medicine evoke such deep respect and arouse so much of our inferiority as when we run counter to a monograph which deals with the problems of biochemistry and its deversified subheadings; namely, physical chemistry, organic chemistry and the like. To the average physician, the very thought of being caught in the toils of such a work arouses memories of laborious experiences and disciplined studies so dis-

connected from his routine clinical efforts that he finds himself unconsciously on the retreat because of the hasty conviction that fools should not tread where angels (or professors) congregate. No one has done more to shatter this fallacy or disillusion the average practitioner from such a fixed inferiority complex than has Professor West in his formal and lucid discussions of the vital interrelated problems that to date have been the no man's land of medicine. To be sure, the exposition calls for a receptive mind, but certainly when once this is given, the reading or study of this work will immeasurably reward any expenditure of time and attention, because it reviews the very fundamentals of the phenomena of vital substance, its laws and adaptation in a manner as to create a vivid picture of the mystery and grandeur of life itself. Once this book is read, the patient will never again become a "case," and all of the myriad of symptoms will be correlated instead of differentiated into an understandable unit. Space will not permit to discuss in the details they deserve any of the ten chapters which compose this text. Broadly, the discussions have been so formulated as to attract the reading interest of the average medical student and physician. It presents a classical *raison d'être* in the preface, so clear, concise and all inclusive that it is a worthy example of terse rhetoric for scientific literature. Indeed, it deserves a place in any volume devoted to famous medical prefaces. Finally, the book begins with an introduction on the scope of biochemistry in medicine and carries the reader through such formal discussions as the structure of matter and some fundamental chemical principles and delves into such classic subjects as the influences of gases, solutions, determination of pH, the colloidal state, electrolytic dissociation, oxydation and reduction, the velocity of reaction, and the like. This book is no lazy man's paradise but for the industrious it is a lasting stimulant.

TEXTBOOK OF ANATOMY AND PHYSIOLOGY. By Diana Clifford Kimber, Carolyn E. Gray, A.M., R.N., and Caroline E. Stackpole, A.M., Associate in Biology, Teachers College, Columbia University, New York. Eleventh Edition. Fabrikoid. Price, \$3.00. Pp. 769, with 353 illustrations. New York: The Macmillan Company, 1942.

This book is in its eleventh edition which indicates its worth. It is intended primarily for the elementary teaching of anatomy and physiology, especially to nurses. Considerable new material has been added. The sections of the book on the mechanics of digestion and absorption, circulation, lymph, respiration and the visceral nervous system have been enlarged. In general, the authors have followed the previous organization of the book in that the chapters or groups of chapters follow in sequence from anatomy to histology to physiology. Throughout the book, an attempt has been made to correlate closely the description of the functions of the body with the microscopic and anatomic structures. The illustrations have been increased from 276 in the tenth edition to 352, and some of those previously used have been redrawn. At the end of each chapter is an outline of the content which makes it easy to re-

view. An attempt has been made to record a large amount of material which is in the literature at present, but only recent, well proved statements are presented. The book is concisely and simply written. It is well outlined and correlated for teaching purposes and can be highly recommended as a textbook for students of anatomy and physiology in the fields related to medicine.

FIRST AID SURGICAL AND MEDICAL, AN ADVANCED MANUAL. By *Warren H. Cole*, M.D., F.A.C.S., Professor and Head of Department of Surgery, University of Illinois College of Medicine, and *Charles B. Puestow*, B.S., M.S., M.D., Ph.D., F.A.C.S., Assistant Professor of Surgery, University of Illinois College of Medicine and the Graduate School. Cloth. Pp. 327, illustrated. Price, \$3.00. New York and London: D. Appleton-Century Company, Inc., 1942.

This book is a manual on first aid for persons who have more advanced training than the average layman who has taken or is taking the primary first aid course being taught throughout the country. The authors aptly point out that although the use of first aid has become more important because of industrial and automobile accidents and the war, it has only been since the recent war that the medical schools throughout the country have shown a tendency to stress the teaching of first aid methods in their curriculums. It was the need of such training in time of peace as well as the present emergency which has prompted the compilation of material for this text, which may be readily used by "freshmen as well as seniors." In the first chapter of the book (which is set in larger type than the remainder for the purpose of emphasis) the authors have stressed the precautions to be taken and the limitations of first aid procedures. The authors caution that it must be borne in mind constantly that "much harm can result from tourniquets; the pressure of tourniquets may damage the tissues locally, but still of more importance is the possibility of the development of gangrene if the tourniquet is left in place too long." It is emphasized that "first aid treatment may mean life-saving, but likewise may be seriously detrimental or even fatal if injudiciously performed." They further point out "words of caution are very necessary in any book on first aid and particularly so in this volume since we are representing many phases of first aid treatment which are obviously beyond the capabilities of one without complete medical training, but describe them to offer educative correlation. The first aid worker must know his own limitations in knowledge and ability, and abide by them."

The general principles of first aid, some of the conditions requiring first aid and the equipment needed are described carefully. The chapter on anatomy and physiology is very brief and concise and gives essential information for administering first aid. It can be understood by the average intelligent untrained individual. The rest of the book deals in general with the usual conditions, technics and methods which are encountered and used in the practice of first aid treatment. Some of the subjects considered are wounds, shock, blood transfusions,

methods of transportation, first aid treatment in the transportation of fractures, compound fractures, respiratory emergencies, injuries to the skull and spinal cord, medical emergencies which include heart disease, and coma and poisons. There is a chapter, too, on civilian versus military casualties in which the types of wounds occurring in the war of 1914 to 1918 are compared to those occurring in the present war.

In general, the book is standard in its instruction. There may be a few statements to which exceptions might be taken; for example, under "treatment of heatstroke" it is stated "apply cold applications to head, neck, and extremities either by cold packs or by a spray or better still wrap patient in a constantly moistened cold wet sheet . . . often other modes of treatment such as ice water enemas or ice packs must be resorted to." There is good evidence that sudden general applications of cold or ice enemas may enhance the fever, by causing peripheral vascular constriction thus preventing evaporation and cooling of the blood of the large vessels of the abdomen and viscera. Thus the bodily temperatures may rise rather than fall.

The book is well outlined, clearly written and can be highly recommended as a manual for advanced students of first aid methods and may be helpful to the physician who has not had occasion to practice first aid procedures.

SURGICAL NURSING. By *William F. MacFee*, A.B., M.D., F.A.C.S., Director of Surgery, St. Luke's Hospital, New York; Attending Surgeon, New York Hospital, New York; and Associate Professor of Clinical Surgery, Cornell University Medical College, New York, and *Manelva Wylie Keller*, B.S., R.N., Former Chief Operating Room Nurse, St. Luke's Hospital, New York; and Anesthetist, St. Luke's Hospital, New York. Ed. 4, Pp. 530, 186 illustrations. Cloth. Price \$3.50. New York: The Macmillan Company, 1942.

This excellent text on surgical nursing, first published in 1921, has gone through three previous editions and this is the fourth. It is written in such a way as to serve the dual purpose of student textbook and simple reference work for the graduate nurse. Throughout the book emphasis is placed on the nature of the disease and on the specific nursing measures in each given case. This type of training, which gives the nurse a comprehension of the disease process involved, makes the associated nursing procedures much more intelligible to her.

The new chapter on the "Cardio-Vascular System" is presented with a different approach and new subjects, such as the application of the sulfonamide drugs in infection, the use of blood plasma for transfusion and the treatment of certain gastric and intestinal conditions by means of the retained suction tube, have been added.

The review questions at the end of each chapter are a direct teaching aid, as are the plentiful and apt illustrations, most of which are actual photographs.

The authors have succeeded in developing a text that is concise and simple in detail, yet complete enough for all practical purposes, without trans-

gressing the rights of teachers and supervisors for interpretation. The opinions of differing surgeons are respected and cautions are given against faulty technic in nursing procedures. The chapters on sterilization and instrument passing are especially thorough. No means have been ignored which would make the student nurse a more conscientious safeguard of her realm in the operating room. This volume is recommended both as a teaching text and as a reference work.

ANNUAL REVIEW OF PHYSIOLOGY. By *James Murray Luck*, Editor, Stanford University, and *Victor E. Hall*, Associate Editor, Stanford University. Cloth. Price, \$5.00. Pp. 784, no illustrations. Stanford University Post Office, California: Published by American Physiological Society and Annual Reviews, Inc. On sale by Annual Reviews, Inc., 1941.

This is the third volume of the excellent Annual Review of Physiology. It contains twenty-nine review articles by recognized authorities on various phases of physiology. The editors lament the fact that on account of the war much of the foreign literature was not available. In past volumes the special senses have been considered in one article, but in this volume they are discussed under the headings of "Hearing," "Visual Recep-

tors," and "Vibratory Sensations and Pain." The review of the material on "The Endocrine Glands" has now been divided into "Metabolic Functions of the Endocrine Glands" and "Endocrine Aspects of Reproduction."

Since, in physical medicine, we are concerned with the stimulation or depression of most of the physiologic processes of the body, all of these reviews are of interest to us, but certain ones in this volume are more important than others to our field. These are: "Bioelectric Potentials," by Bishop; "The Physiological Effects of Radiant Energy," by Laurens; "Temperature Regulation," by Scott and Bazett; "Energy Metabolism," by Carpenter; "Muscle," by Fenn; "Peripheral Circulation," by Hall, and "Exercise," by Steinhaus. In the preface the editors say, "The concluding chapter ('Exercise') is a modest venture in applied physiology under which, in future years, we hope to give appropriate attention to industrial physiology, aviation physiology, and so forth." Physiology is fully as important as anatomy to both technicians and physicians in the field of physical medicine. We cannot escape the necessity of keeping well informed on progress in this field.

This third volume of the "Annual Review of Physiology" cannot be too highly recommended to those in every field of medical endeavor, since physiology is fundamental to all.

Present Status of Electrical Stimulation of Denervated Muscle — Grodins, Osborne and Ivy

(Continued from Page 734)

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PHYSICAL THERAPY ABSTRACTS

The Need for Trained Personnel in Army Departments of Physical Therapy. Frank H. Krusen.

From Editorials Surg., Gynec. & Obst. 74:1160 (June) 1942.

In the modern military hospital the department of physical therapy plans an important part. Traumatic lesions commonly encountered in military practice often require physical treatment during the stage of rehabilitation. During the last war it was estimated that 50,000 to 75,000 reconstruction cases would be received per year from each 1,000,000 men overseas; and by June, 1919, there were forty-five officers, fifty-four enlisted men and 700 reconstruction aides devoting their time to physical therapy.

At the present time there is, an extreme shortage, not only of physical therapy physicians, but also of physical therapy technicians (physical therapy aides). It has been estimated that 300 physicians and more than 2,000 physical therapy aides will be needed in military hospitals. At present there are in this country only about 1,600 qualified physical therapy technicians to take care of civilian needs. There was a shortage of such workers prior to the war; and since Pearl Harbor, the need for trained medical specialists and trained technicians in physical therapy has become extremely acute.

Plans have been developed for the training of a certain number of medical officers to conduct military physical therapy departments, and a number of schools for physical therapy technicians are in existence. The great need at the moment is to obtain a sufficient number of qualified students for both courses. The Surgeon General's Office is now assigning active and reserve medical officers interested in the subject of physical medicine for special training in the field, and any medical officer who is interested in such training should consult the Office of the Surgeon General. The physician who is not a reserve officer and who desires such service should make application for it through Procurement and Assignment Service for Physicians, Washington, D. C.

The Responsibility of Medical Schools to Teach Physical Therapy. Eben Carey.

J. A. M. A. 119:262 (May 16) 1942.

The administrators of medical schools have a tremendous responsibility during these times of World War II. They now face an accelerated program to shorten the medical course from four to three years and demands for hours allocated for certain additional courses. These problems are presented in the face of an overcrowded medical curriculum which includes the present four years of educating medical students. We are faced both with a reevaluation and a reemphasis

on basic essentials of teaching methods and of the content of the medical courses. During this period of stress it is not my desire to propose an additional burden but to point out the great need that our graduates have, who were yesterday our students, for practical instruction in the indications and contraindications of physical therapeutic methods.

Notwithstanding the venerable age of physical therapy and its many worthy uses, it gradually fell into disrepute, and at the time of our entry into World War I practically no instruction in this subject was given in any of the medical schools. One reason for this was its wide exploitation by quacks and charlatans, which caused conservative physicians to look on it with distrust. Others, overenthusiastic, made unwarranted and exaggerated statements as to its value, which further alienated members of the medical profession.

If physical therapy is to remain under the control of physicians and advance as it should along sound scientific lines, the indifference which the internists as a group have displayed in the past must give way to an active interest in developing a constructive, forward looking policy to improve the practice of an extend education in physical therapy.

As an example of the need of instruction in physical therapy on the part of general practitioners, I may cite the demand for instruction manifested during the last two years at the exhibit on low back pain under the direction of Dr. Frank Ober at the annual meetings of the American Medical Association. A faculty of over fifty demonstrators has exemplified the methods of physical examination of the peripheral nerves and muscles, bones and joint range of motion, as well as simple physical therapeutic procedures of heat, massage, exercise and passive and active motion. The doctor wants this knowledge because of the demands on the part of the public for this agency of relief and the neglect on the part of medical schools to emphasize this modality of treatment to its medical students.

This neglect is manifested in the fact that the most difficult course for the medical administrative officer to organize is the one on physical therapy. Dr. Piersol states that you may comb a great metropolitan center and still find little (organized) material to give students a constructive course along this line. As a nation, faulty posture is one of our outstanding shortcomings noted in draftees. Among those nations in which mass exercise has been in vogue for many years, youths have acquired good posture and are better prepared for military services. He also emphasizes that physical therapy, including those procedures used in heart disease, are adjuncts. Physical therapeutic aids will tend to shorten convalescence and

increase the well-being of patients not only physically but also psychologically.

Our duty to medical students and the medical profession will not be fulfilled until each medical school formulates a teaching program in physical therapy. We owe this duty likewise to the public, because physical therapy is part of the art of healing.

Management of Chronic Arthritis. Eugene F. Traut.

Illinois M. J. 81:199 (March) 1942.

Physical therapy, supervised by a physician, is indispensable. Heat can be best applied locally with heat lamps or bakers. Hot compresses are especially valuable in the exacerbations. Contrast baths lend themselves to treatment of subacute or chronic arthritis of the extremities. Wax baths can be best utilized in treating the hands or feet. Fever therapy has proved of temporary benefit in a few stubborn cases.

Patients with atrophic arthritis tend to assume the posture of fatigue: kyphotic upper spine with winged scapulae, lordotic lower spine with protuberant abdomen, flat feet. They are coached in the postural exercises of Goldthwaite and Osgood and corrective foot exercises are stressed. Proper shoes are definitely prescribed and are adjusted to the patient's needs by soft felt padding.

Diathermy is the most convenient and effective means of heating deep tissues. Short wave high frequency has practically replaced conventional diathermy. In my practice it is applied by means of the induction field utilizing a cable electrode.

Careful roentgen ray treatment often relieves the symptoms of Marie-Struempell's disease, poker back or atrophic arthritis of the spine.

Joints afflicted with hypertrophic arthritis have to be protected against trauma. With this in mind the obese patients must reduce weight. Many of them are women in the menopause leading to the designation menopausal arthritis. These women irrespective of their basal metabolism readings frequently improve on thyroid. Estrogenic substances have failed consistently to benefit patients with arthritis. These substances, theelin and estradiol, have effectively removed the arthralgic complaints of the climacteric. Only second to the metabolic approach is the effectiveness of physical therapy in hypertrophic arthritis. Reassurance that invalidism with deformity is unlikely is of help in treating this type of arthritis.

Nonsplinting Treatment of Fractures of the Elbow Joint. A. A. Neuwirth.

J. A. M. A. 118:971 (March 21) 1942.

In the series of cases to which this new concept of treatment was applied, no fixation was employed by external splints or casts or other measures ordinarily used for immobilization. The fracture or fractures in the vicinity of the elbow joint were maintained in the functionally flexed position by a simple triangular bandage suspended from the neck. Movement of the forearm and arm as well as of the elbow joint was encouraged as

soon as possible, in keeping with the painful limits of the injury. A good deal of induration and swelling is precipitated almost immediately after such a fracture, and the application of a cast or external splint would only aggravate this condition and should, I think, be considered a dangerous procedure. Furthermore, the nonfixation treatment permits close observation of the condition of the joint and early treatment of any untoward symptoms and complications.

While many authors do not consider it advisable to institute active or passive motion for several days or weeks after the injury, the author has found that motion of the hand, finger, forearm and wrist, when encouraged as soon as possible, produced a better functional result and was in line with the universal concept of functional therapy. Neuwirth agrees with Eliason and North, however, that it is the voluntary, active movement of the patient, which constitutes the major element in recovery. The surgeon may guide movements; he may support the weight of the extremity, but he cannot hasten matters by forcible passive motion or stretching under anesthesia.

The important thing from the patient's point of view is to get as perfect a restoration of function as possible. The anatomic correction, as Frost says, may be of great importance in the event that a compensation case goes before the industrial commission. It is interesting to note in this connection that many times roentgenograms will show that there is improper anatomic correction, but functionally the result is satisfactory. McKee humorously describes his mountaineer patients having fractured elbow joints and his trials and tribulations in treating them. He describes devious types of fixing devices he has had to use. Most interesting in relation to this article are 2 cases he recounts in which, because of excessive swelling and edema, he applied no splinting apparatus. The arm was allowed to lie on a pillow at the carrying angle. In both of these cases he reports, function is 100 per cent. McKee adds "Our results have run the cycle of recovery as truly as has our treatment; some untreated cases have regained 100 per cent function; one much treated case, a 90 per cent dysfunction."

The author reports a group of cases of elbow fracture treated at Fort Totten Station Hospital by the non-splinting methods. All of these patients regained 100 per cent function.

Electrolysis. Introduction of an Instrument for Relatively Painless Treatment. Eugene A. Hand.

Arch. Dermat. & Syph. 45:1094 (June) 1942.

High frequency diathermy for destruction of the follicle was first suggested by Bordier, in 1932. In recent months the author has used this method extensively for treating hypertrichosis. He believes it is speedy, effective and will most likely supersede electrolysis for treatment of this condition. The percentage of permanent epilation in his hands has been much higher with this method.

The pain of the electrolysis procedure can be lessened or eliminated either by the use of a

topical or local anesthesia or by an improvement of the electrolysis instrument. Topical anesthesia on the skin is not satisfactory. Local anesthesia prior to electrolysis for numerous superfluous hairs is not practical. Its use prior to treating telangiectases causes the capillaries to fade, making the electrolysis a hit or miss affair. When its use is practical, as in the removal of a few nevi or verrucae, it should be employed.

The useful component is that due to the electrolytic action on the tissues. This can be decreased by using a small maximum milliamperage and also by gradually raising the current to take advantage of the partial anesthesia about the needle as the cells and nerve receptors are destroyed. The useless component can be entirely eliminated by gradually raising and lowering the current to eliminate the painful shocks caused by the sudden make and break of the current which is found with the Michaels circuit. A foot-controlled instrument to eliminate these shocks and their associated pain and also to facilitate the gradual raising of the current is described.

The Treatment of Hypertrichosis by Electrocoagulation. Charles Lerner.

New York State J. Med. 42:879 (May) 1942.

The technic concerning asepsis, positions of the patient and operator and other details is essentially that of electrolysis. The needle is inserted with the usual precautions and the current is turned on by means of a foot switch that should require only slight pressure. Utilizing a current of approximately from 60 to 75 milliamperes, the foot switch should be pressed for one second, three or four times and the hair removed with forceps without resistance.

The hairs were clipped to a length of approximately $\frac{1}{2}$ inch from the skin surface so that the direction into the follicle could be more accurately followed. The intensities of current experimented with varied from approximately 125 to 60 milliamperes, beginning at the upper part of the forearm and decreasing as I proceeded toward the wrist, removing a few hairs with each decrease of current, carefully avoiding the removal of those that were close neighbors. I found that a current intensity of approximately 60 to 75 milliamperes was almost painless when applied intermittently for a total time of about three seconds.

Eighty-two clinic patients and 21 in private practice were subsequently treated by this method. Hairs were removed from the cheeks, chin, the upper lip, the breasts, and the upper and lower extremities. Only 6 patients of the entire number treated complained of some pain, but none stated that it was unbearable. Some developed immediate perifollicular erythematous reactions that were more intense than those of others and on investigation those patients were found to have some general vasomotor disturbance, particularly hypotension. The impression was gained that all reactions on the face were generally less intense than those on the covered

parts of the body. All evidence of reactions had disappeared within three weeks.

In my opinion, the electrocoagulation method, though safe in the hands of an experienced dermatologist, could prove ineffective, destructive, and disfiguring if used by an amateur. Since it is really electrosurgery, its use should legally be limited to licensed physicians.

Modern Concepts in the Treatment of Bronchial Asthma. Henry D. Ogden.

New Orleans M. & S. J. 94:490 (April) 1942.

Hyde has recently reported good results with rather mild fever therapy, using a humidified external heating type of cabinet. He reports improvements in 75 per cent of his cases. His results seem to be better than when longer and higher fevers are used.

Diathermy: Studies of the Effects of Various Frequencies on Colloids and Tissues. M. B. Levin, M.D.; C. H. Burton, M.D., and R. Roseman, Ph.D.

Physiotherapy Rev. 22:179 (July-Aug.) 1942.

These authors reached the following conclusions:

(1) From the clinical standpoint, the most effective of all diathermy machines tested by us was one embodying frequencies peaked at approximately 1,000,000 cycles (and without load comprising approximately 800,000 to 1,400,000 cycles and under load spreading from approximately 600,000 to 1,900,000 cycles).

(2) The coagulation effect of diathermy currents in egg albumin began at a focal distance away from each electrode, from there spreading toward the electrodes; it did not begin at the electrodes, spreading from there toward the center of the containing vessel.

(3) The time of exposure (within limits) controlled the depth or spread of coagulation or cooking.

(4) The amount of current per square millimeter of electrode area controlled, to some extent, the intensity of the heat or disruption of the cells, producing either partial or complete coagulation, or cutting.

(5) Frequency determined the "jumping power" or penetrating effect of the current; increasing the frequency beyond a certain point lessened control of the heating and increased undesirable side-effects.

(6) The sharpest, best limited, controllable coagulation in albumin was found at approximately 560,000 cycles.

(7) The best controllable and limited coagulation of tissues with bipolar current was found at about 560,000 cycles.

(8) Good cutting current (bipolar and monopolar) with the best control of side-effects was found in the vicinity of 400,000 to 750,000 cycles.

(9) The best monopolar current effects with limited desiccation, coagulation and cutting, and with the least charring, were found at approximately 560,000 cycles.

Effect of Mercury Vapor Lamps on the Eye.

Queries and Minor Notes, J. A. M. A. 119:232 (May 9) 1942.

To the Editor. — I should like to know if there is any evidence that mercury vapor lamps, as used for industrial lighting, cause any symptoms of eye irritation or disturbances of vision. If there is no direct effect on the eyes, would the distortion of colors (of manufactured parts such as various colored cables) be a source of eye irritation or visual disturbance?

H. W. GARTON, M.D., Fort Wayne, Ind.

Answer. — Mercury vapor lamps, when the rays are directed into the eye, can cause an irritating conjunctivitis and superficial punctate keratitis. The lights used industrially, however, are usually very high and of insufficient intensity to cause irritation to the average person. A light-complexioned individual is more susceptible to such rays than a brunet type. It is unlikely that working on colored objects under colored light would be any additional source of irritation. Exposure without the use of goggles for a long time to the rays from colored vapor lamps, in the form of the so-called sunlight lamps, produces a superficial punctate keratitis of varying degrees, depending on the length of exposure, and can even cause permanent visual disturbances by opacities of the cornea.

Basil Graves cites such a case in "The Eye and Its Diseases," by Behrens, and Duke Elder, in his "Advances of Ophthalmology" (Philadelphia, P. Blakiston's Sons & Co., 1934), describes the pathology of this condition. — (Reprinted with permission.)

Ultraviolet Burns of the Eye.

Queries and Minor Notes, J. A. M. A., 118:1264 (April 4) 1942.

To the Editor. — With the expansion of the heavy industries the number of cases of ultraviolet burns of the eye has greatly increased. Can any curative substances be used locally in the eye in such cases?

JONAS S. FRIENDENWALD, M. D., Baltimore.

Answer. — Inflammation of the eye caused by ultraviolet rays involves only the cornea, causing a characteristic photophthalmia. Only the epithelial cells are involved, although in prolonged exposure the surface is stippled, slightly at first, but, as the latent photochemical reactions develop, the individual epithelial cells extrude their nuclei and finally desquamate. The entire process is

characterized by extreme rapidity of cell death and of cell regeneration.

In the beginning of an attack of photophthalmia, iced applications are of some value. One of the more recent corneal anesthetics afford relief, but cocaine is contraindicated. An antiseptic agent to prevent infections of the eroded areas is of definite value. After twenty-four hours, heat hastens epithelial regeneration. There are no known therapeutic agents of curative value; but the condition is self limited, provided there is no intercurrent infection of the corneal surface. (See Duke-Elder, W.S.: Textbook of Ophthalmology, St. Louis, C. V. Mosby Company 1:818.) — (Reprinted with permission.)

Action of Sulfathiazole on Artificial Fever. H. Nicolai.

München med. Wchnschr. 88:1084 (Oct. 3) 1941.

Nicolai demonstrated that sulfapyridine exerts a central, fever depressing effect. He found in recent experiments that sulfathiazole has practically no such effect. He concludes that, if fever declines after the administration of sulfathiazole, it indicates that the microorganisms have been definitely counteracted. — (Abst. J. A. M. A. 119:1060 [July 25] 1942.)

Artificial Fever Therapy in Juvenile Neurosyphilis. Juul C. Nielsen; Johann R. Marx and Herman A. Dickel.

Arch. Dermat. & Syph. 45:688 (April) 1942.

Five patients suffering from juvenile neurosyphilis were treated with artificial fever therapy, produced with the Kettering hypertherm, and with subsequent chemotherapy. One patient died during treatment and the rest showed physical and mental improvement during an observation period of from one to three and a half years. In one instance, a patient with juvenile tabes, the improvement was only of about one year's duration and not great. The serologic reactions of the blood remained positive in all. The serologic reactions of the spinal fluid became normal in 3 cases (in 1 of them this improvement was only temporary). One patient, suffering from tabes, showed improvement in the spinal fluid only at the end of two years, after completion of fever therapy.

The authors recommend the use of this type of fever therapy as a valuable adjunct to the customary chemotherapy in cases of juvenile neurosyphilis and believe that the results compare favorably with those obtained by other investigators with malaria therapy. As in the cases of adult neurosyphilis, the tabetic patient in our series showed no permanent improvement.



Report of Progress in the Application of Artificial Fever in the Treatment of Syphilis and Gonococcal Infections. H. Worley Kendell,* M.D., Director, Department of Physical Medicine, Miami Valley Hospital; Director, Kettering Institute for Medical Research, Dayton.

The Treatment of Rheumatic Chorea and Complicating Endocarditis by Artificial Fever Therapy. Robert F. Dow,* M.D., Director of the Fever Therapy and Physical Therapy Department, St. Joseph's Hospital, Paterson, N. J.

The Importance of Physical Therapy in México. Nicandro Chávez, M.D., Professor, Physical Therapy, National Medical School of México, México, D. F.

Manipulative Surgery. John W. Fredette, M.D., Assistant Professor of Surgery, University of Pittsburgh School of Medicine, Pittsburgh.

A New Approach in the Treatment of Backache. A. W. Schenker, M.D., Instructor in Physical Therapy, Columbia University Postgraduate Medical School, New York, N. Y.; and William Bierman, M.D., Assistant Clinical Professor, Therapeutics, New York University College of Medicine; Attending, Physical Therapy, Mount Sinai Hospital, New York, N. Y.

Function of Leg Stumps and Prostheses. Paul B. Steele, M.D., Professor, Orthopedic Surgery, University of Pittsburgh, School of Medicine, Pittsburgh.

Ultraviolet Irradiation of Auto Transfused Blood in the Treatment of E. Coli Septicemia. Elmer William Rebbeck, M.D., Senior Active Staff Surgeon, Shadyside Hospital, Pittsburgh.

Cultivated Relaxation for the Elimination of "Nervous Breakdowns." Edmund Jacobson, M.D., Director, Laboratory for Clinical Physiology, Chicago.

The Need for Physical Therapy Technicians. J. S. Coulter, and H. A. Carter, Council on Physical Therapy, American Medical Association, Chicago.

Report to the National Foundation for Infantile Paralysis: Results of the "Long Arc" and the "Short Arc" Treatment in the After-Care of Poliomyelitis. C. O. Molander, M.D., and Bertha Weinmann, M.D., Department of Physical Therapy, Michael Reese Hospital, Chicago.

The Galvanic Bath. Harry Tevel Zankel,* M.D., Instructor, Physical Therapy, New York Polyclinic Medical School and Hospital; Director, Department of Physical Therapy, Beth Moses Hospital, Brooklyn, N. Y.

Rehabilitation of the Injured Workman. Frederic Jefferson Kellam, M.D., Chief of Traumatic Division, Indiana Hospital, Indiana, Pa.

Sustained Internal Radiant Heat in Lesions of the Pelvis. Lieut. Comm. Bengt Norman Bengtson,* Medical Corps, United States Navy, Great Lakes Naval Training Station, Great Lakes, Ill.

The Artificial, Negative Aeroionization. Professor A. L. Tchijevsky, Director of the Central Laboratory of Ionization in Moscow.

The Physiologic Basis for the Treatment of Paralyzed Muscle. H. M. Hines, Ph. D.; J. D. Thomson, Ph.D., and M. Lazere, M.S., Iowa State University School of Medicine, Iowa City.

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